THE CENTENARY OF THE LAUNCH OF BELL'S "COMET": GLASGOW & THE CELEBRATIONS.

"TO THE MEMORY OF HENRY BELL": THE CHIEF TOAST GIVEN AT THE "COMET" CENTENARY LUNCHEON, AT GLASGOW, BY MR. M'KINNON WOOD, SECRETARY FOR SCOTLAND.

The luncheon which formed a part of Glasgow's festivities in celebration of the centenary of the launch of Henry Bell's steam-ship, the "Comet," was an exceptionally interesting function. The Corporation entertained some four hundred and fifty guests, including the Secretary for Scotland, and famous shipowners, engineers, and business men. Mr. M'Kinnon Wood, proposing "The Memory of Henry Bell," said that Bell had prescience, tenacity of purpose, and great courage. He died a poor man, but he would have died in actual want had not the Clyde Trustees granted him £100 a year; while the Government presented him with the inadequate gift of £200. The Clyde, he went on, has never lost the prestige it owes to Bell. He launched the first steam-ship upon waters which have since borne thousands of great ships, the carriers of the commerce of the world. The banks he passed on his early voyages are now covered with ship-building yards whence are launched the finest merchantmen and war-ships, many of them a thousand times as large as the little "Comet." From left to right, the chief figures are: Captain C. L. Napier, Sir Hugh Shaw-Stewart, Bt., the Right Hon. James Caldwell, the Right Hon. Alexander Ure, Lord Lamington, the Right Hon. Thomas M'Kinnon Wood, Lord Provost Stevenson, Admiral Sir John Jellicoe, the Marquess of Ailsa, Lord Kingsburgh (the Right Hon. Sir John Hay Athole Macdonald, Lord Justice-Clerk of Scotland), the Right Hon. C. Scott Dickson, the Right Hon. James Parker Smith, and Sir Charles Bine Renshaw, Bt. The whole proceedings passed off most successfully.

Drawn by S. Begg, our Special Artist at Glasgow.

THE CENTENARY OF THE FIRST PASSENGER STEAM-BOAT IN EUROPE: *HENRY BELL AND THE "COMET."*

OF the many anniversaries of important events in our national history which have called for celebration this year, or still call for it, none is of greater interest than that of August 6. On that day, one hundred years ago, the steam-boat *Comet* made her first trip on the river Clyde and heralded an epoch in the progress of civilisation, as well as a great triumph for man in his persistent fight against the elements. This tiny germ was the precursor of the floating palaces of the present day and the mercantile and naval services of the world.

The idea of steam navigation dates as far back as the year 1543, when a Spanish captain named Blasco de Garay experimented in Barcelona Harbour with a steam-boat of his own invention. This vessel, which was of 200 tons burden, attained a speed of three miles per hour. In 1736 various trials were made on the Severn; and in the later half of that century both Frenchmen and Americans were engaged in attempts to solve the problem of steam navigation.

THE BUILDER OF THE STEAM-BOAT "COMET": JOHN WOOD.

In 1788 William Symington, a native of Leadhills, Lanarkshire, achieved success by propelling a double-keeled vessel on Dalswinton Loch, Dumfriesshire, and in 1789 he fitted out a larger boat with engines, which was propelled at a speed of six miles per hour on the Forth and Clyde Canal. His *Charlotte Dundas*, a stern-wheeler, built at Grangemouth in 1801, made an experimental trip to Glasgow, and was intended for towing sloops on the Forth and Clyde Canal, but was withdrawn owing to the damage caused to the banks through the wash of the paddles. It was on this vessel that Fulton, the American engineer, who claimed to be the inventor of steam navigation, was, on one occasion, a passenger, and made the acquaintance of Symington. In 1803 another attempt was made by Symington with his second *Charlotte Dundas*, but the Directors of the Forth and Clyde Canal, with a lack of foresight, and being apprehensive of their banks, ordered this boat to cease operations. Symington's experiments, so far fairly successful, had involved him in financial difficulties. He died in London in 1831, and was buried in the churchyard of St. Botolph, Aldgate.

Something of the perverse fate which dogged the efforts of Symington to convince his contemporaries of the great method of navigation attended the work of Henry Bell. Bell, however, has the distinction of producing the first practical steam-boat to ply regularly on European waters. He was born at Linlithgow on April 7, 1767, and was first employed as a

OWNER AND DESIGNER OF THE "COMET," THE FIRST PASSENGER-CARRYING STEAMER ON THE CLYDE: HENRY BELL.

stonemason. Three years at that trade proved enough for him, and he subsequently served an apprenticeship as a mechanic.

During the time Symington was experimenting on Dalswinton Loch and the Forth and Clyde Canal, Bell was studying the possibilities of steam for the propulsion of ships. As early as 1800, a year before the appearance of the first *Charlotte Dundas*, Bell had applied to the Lords of the Admiralty for leave to demonstrate to them the practicability and utility of an invention whereby vessels might be driven against wind and tide. The Lords of the Admiralty came to the conclusion that his scheme was unworkable, and could not give him their support. Lord Nelson, however, was a warm supporter of Bell's plans, and saw with a clear eye the vast possibilities of the enterprise. It is recorded that he threw out a serious warning to their Lordships in the following famous words—

"My Lords and Gentlemen,—If you do not adopt Mr. Bell's scheme, other nations will, and in the end vex every vein in the Empire. It will succeed, and you should encourage Mr. Bell."

Bell was, fortunately, endowed with a plentiful stock of confidence in the utility of his scheme, and was not discouraged by a short-sighted Government. He experimented with a pleasure-boat, into which he placed a boiler and engine of four horse-power. Subsequently he sought the advice of James Watt as to a portable engine that would stand on its own base, with strong levers, of which he suggested the design. Watt's reply was discouraging. He wrote thus—

MAKER OF THE "COMET'S" ENGINES: JOHN ROBERTSON.

"How many noblemen, gentlemen, and engineers have puzzled their brains and spent their thousands of pounds, and none of all these have been able to bring the power of steam in navigation to a successful issue."

Bell now made overtures to the European Powers, and also to the United States, and so impressed was the Government of the latter with Bell's scheme that they commissioned Robert Fulton, who was in England on their behalf taking drawings of cotton and other machinery, to visit Bell and investigate his claims. He was much with Bell, and Bell's models were those which he adopted when he recrossed the Atlantic. Indeed, the engines of the steam-boat *Clermont*, which plied on the Hudson in 1807, the first American vessel to be propelled by steam, were built, on Bell's suggestion, at the works of Messrs. Bolton and Watt, Birmingham.

On the dispute as to who has the honour of inventing the steam-ship, the Report of the Select Committee of the House of Commons on Steam-Boats,

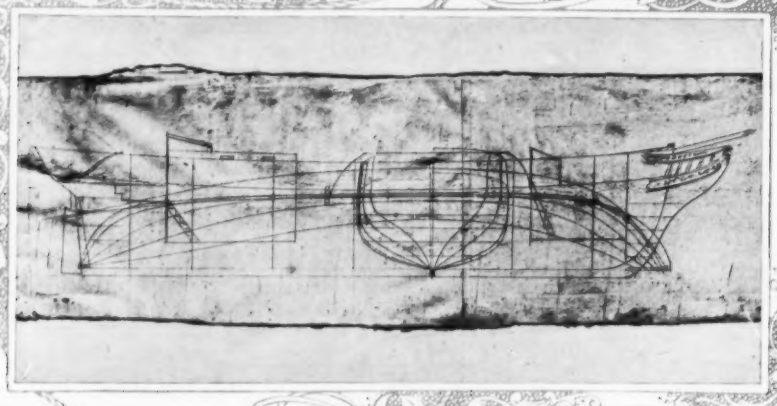
(Continued overleaf.

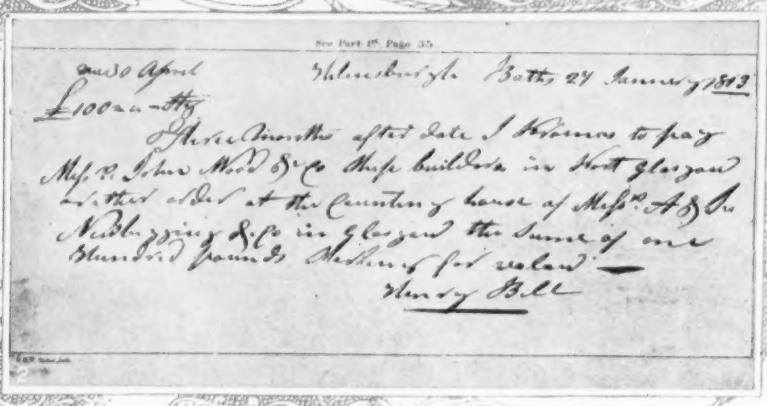
THE FIRST PRACTICAL STEAM-BOAT TO PLY REGULARLY ON EUROPEAN WATERS: BELL'S "COMET," WHICH WAS LAUNCHED IN 1812.

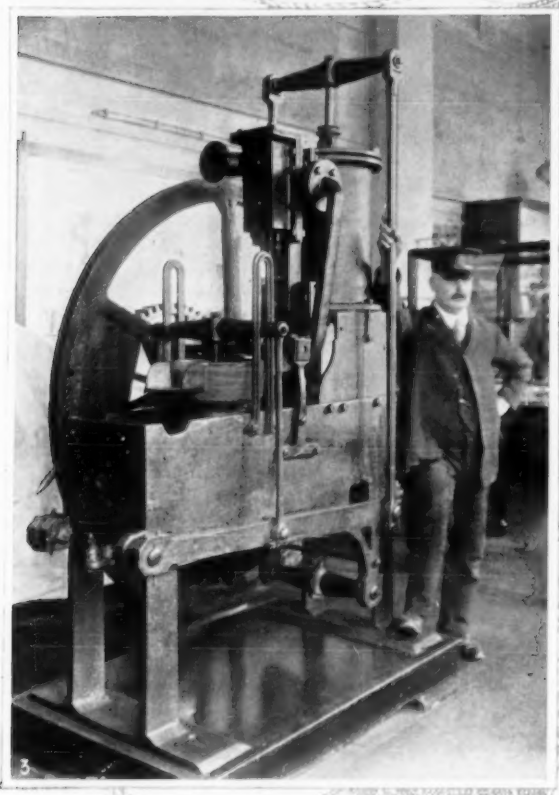
The "Comet" first plied between Greenock and Glasgow, and then extended her sailings—for instance, through the Kyles of Bute to Tarbert, Loch Fyne, thence through the Crinan Canal to Oban and Fort William. Later still, she was transferred to Grangemouth, and then resumed her West Highland voyages.—[DRAWN BY A. FORESTIER.]

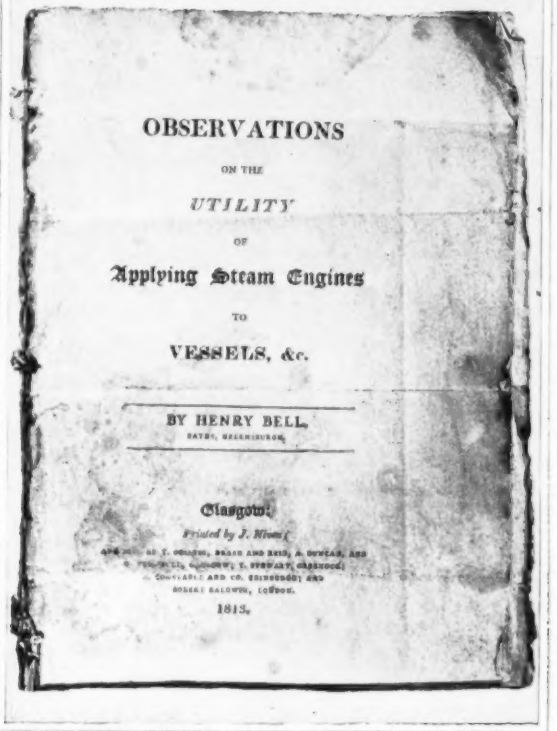
FIFTY FEET LONG AND WITH A 3-H.-P. ENGINE: THE STEAM-SHIP "COMET."

PHOTOGRAPHS SPECIALLY TAKEN FOR "THE ILLUSTRATED LONDON NEWS."




See Part 1st. Page 35.
Helensburgh Bath 24 January 1813
£100 sterling
three months after date I promise to pay
Messrs. John Wood & Co Shipbuilders in Port Glasgow
the sum of one
Hundred Pounds sterling
Henry Bell



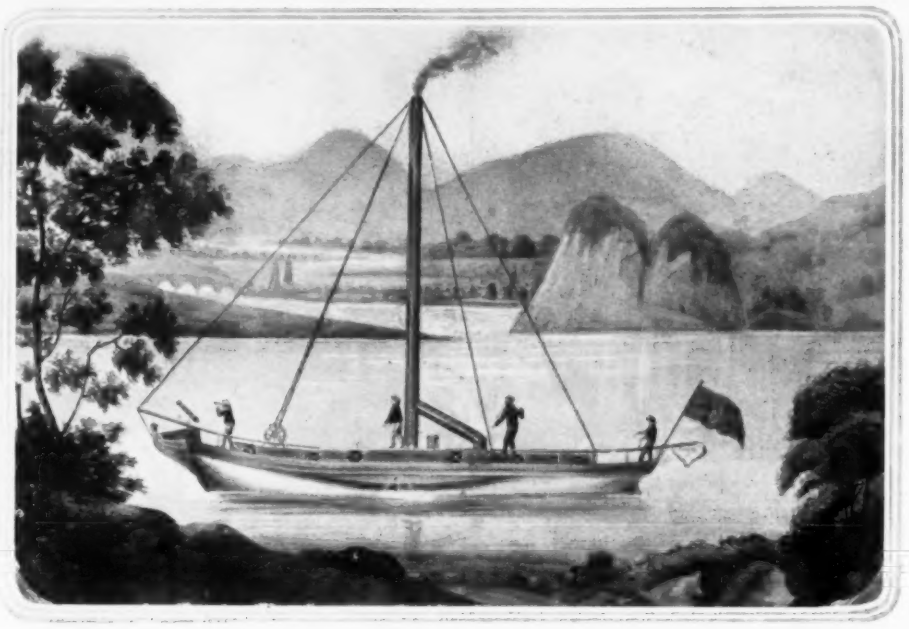


1. THE "COMET" PLANNED ON PAPER: THE ORIGINAL SHEER DRAUGHT OF HENRY BELL'S PADDLE-STEAMER.
2. FOR THE BUILDING OF THE "COMET": A PROMISSORY NOTE FROM HENRY BELL TO JOHN WOOD.
3. OF THREE HORSE-POWER: THE ENGINE OF THE "COMET," MADE BY JOHN ROBERTSON.
4. SHOWING "THE 'COMET,' THE FIRST STEAM-BOAT IN BRITAIN": HENRY BELL'S BUSINESS CARD.
5. FROM THE FIRST STEAMER SEEN ON THE CLYDE: THE BELL AND COMPASS OF THE "COMET."
6. PRINTED IN GLASGOW IN 1813: A PAMPHLET BY HENRY BELL.
7. THE FIRST PASSENGER-CARRYING STEAMER ON THE CLYDE: A MODEL OF THE FIFTY-FEET LONG "COMET."
8. WHERE THE "COMET" WAS BUILT: JOHN WOOD'S YARD, PORT-GLASGOW.

With the exception of the "Comet's" engine, which is in South Kensington Museum, everything illustrated on this page is to be seen in the extremely interesting British Steam Navigation Centenary Exhibition in the Kelvingrove Museum, Glasgow. The following notes as to certain of the subjects should be made. The original sheer draught of the "Comet" was presented by Mr. John Wood to Mr. Low, Sawmills, Port-Glasgow, and on his death passed to Mr. Matthew Blackwood. The exhibition contains three promissory notes from Henry Bell—one to Messrs. John Wood and Co. towards the building of the "Comet" and two to David Napier for the boiler. The "Comet's" engine was condensing—of 3 h.-p. The engine-shaft appears to have been of cast-iron and fitted with a fly-wheel. Henry Bell's business card is lent to the exhibition by Mr. John Wilson, of 83, Jamaica Street, Glasgow. The bell and the compass of the "Comet" are the property of the Corporation. The "Comet" had an over-all length of 50 feet, a breadth of 11 feet, and a depth of 5 feet 6 inches. The paddles were simply four blades fixed on arms, two on each side of the boat. These not being satisfactory a single pair was substituted, the hull was lengthened, and a new engine put in. "The engine of the 'Comet' was at first about 3 horse-power. The cylinder was placed vertically, the piston-rod had a cross-head from which depended two side rods which were connected to a lever below, from which motion was given to the connecting rod and crank. A large fly-wheel was added to steady the motion, and toothed wheels connected the engine-shaft with the paddles."

published in 1822, sums up the various claims to that distinction. It states—

"Mr. Jonathan Hulls, in 1736; the Duke of Bridgewater, on the Manchester and Runcorn Canal; Mr. Miller, of Dalswinton; the Marquis of Jouffroy, a French nobleman, in 1781; Lord Stanhope, in 1795; and Messrs. Symington and Taylor, on the Forth and Clyde Canal, in 1801-2: these ingenious men made valuable experiments and tested well the mighty power of steam. Still no practical uses resulted from any of these attempts. It was not till the year 1807, when the Americans began to use steam-boats on their rivers, that their safety and utility was first proved. But the merit of constructing these boats is due to the natives of Great Britain. Mr. Henry Bell, of Glasgow, gave the first model of them to the late Mr. Fulton, of America, and corresponded regularly with Fulton on the subject. Mr. Bell continued to turn his talents to the improving of steam apparatus and its application to various manufactures around about Glasgow; and, in 1811, constructed the *Comet* steam-boat (the first of its kind in Europe) to navigate the Clyde from Glasgow to Port Glasgow, Greenock, Helensburgh and Inverness."



AS SHOWN IN AN OLD PRINT: THE "COMET" AS SHE WAS IN 1812, THE YEAR OF HER LAUNCH.

About 1807, Bell had a definite conception of the style of engines he desired for propelling a vessel. A year or two later he was in communication with the brothers John and Charles Wood, shipbuilders, Port Glasgow, and eventually commissioned John Wood to build a vessel for him at his yard, Port Glasgow. The engines were made by John Robertson, engineer, Glasgow, and the boiler by David Napier.

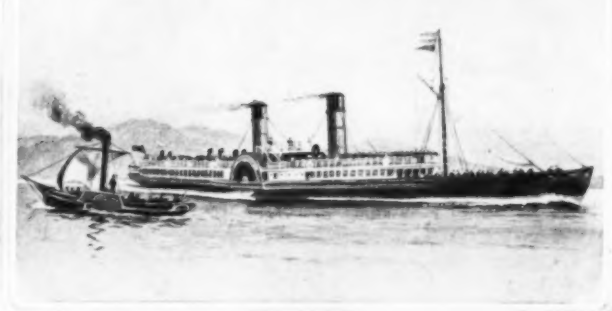
The date of the launch, on the authority of a list supplied by the builders, and contained in a Parliamentary Report of 1822, is July 24, 1812. The vessel was launched practically complete with steam up, and was named the *Comet*, after a meteor which appeared in the heavens some time previously. Built of wood, she was 43 ft. 6 in. long; 11 ft. 4 in. broad; 5 ft. 9 in. deep, with a draught of 4 ft. She carried a large square sail, which was brought into use when the weather was favourable. The engine was of the condensing type of three horse-power, the cylinder 11½ in. diameter, and the stroke 16 in. She was originally fitted with two pairs of paddle-wheels, 7 ft. in diameter. The preliminary trials of the vessel proved a failure owing to one pair of paddle-wheels working in the wash of the other, and causing a loss of power. One pair of the paddles was removed, and another engine of four horse-power substituted, having a cylinder of 12½ in.

The *Comet's* first voyage was from Greenock to Glasgow, on Aug. 6, 1812, the distance of twenty-two miles being covered in 3½ hours. After plying on the Clyde for a month, her sailings were extended, as we find that she sailed through the Kyles of Bute to Tarbert, Loch Fyne, thence through the Crinan Canal to Oban and Fort William, the return journey occupying four days. The *Comet* was, therefore, the first steamer to use the Crinan Canal. After a short time on this route she was transferred to Grangemouth, but in August 1819 she reappeared on the West Coast and resumed her West Highland voyages.

On Dec. 19, 1820, the *Comet*, on a voyage from Oban to Glasgow, was wrecked outside Crinan, the crew and passengers fortunately being able to scramble ashore. When the *Comet* was wrecked, Bell was on board, and on his way to Glasgow to arrange for the building of a larger vessel; and in 1821 the second *Comet* was built by James Lang, of Dumbarton. She also traded in the West Highlands for a few years, but her career was shorter than that of her predecessor, as on Oct. 21, 1825, she collided with the steamer *Ayr*, off Gourock, seventy of the passengers being drowned.

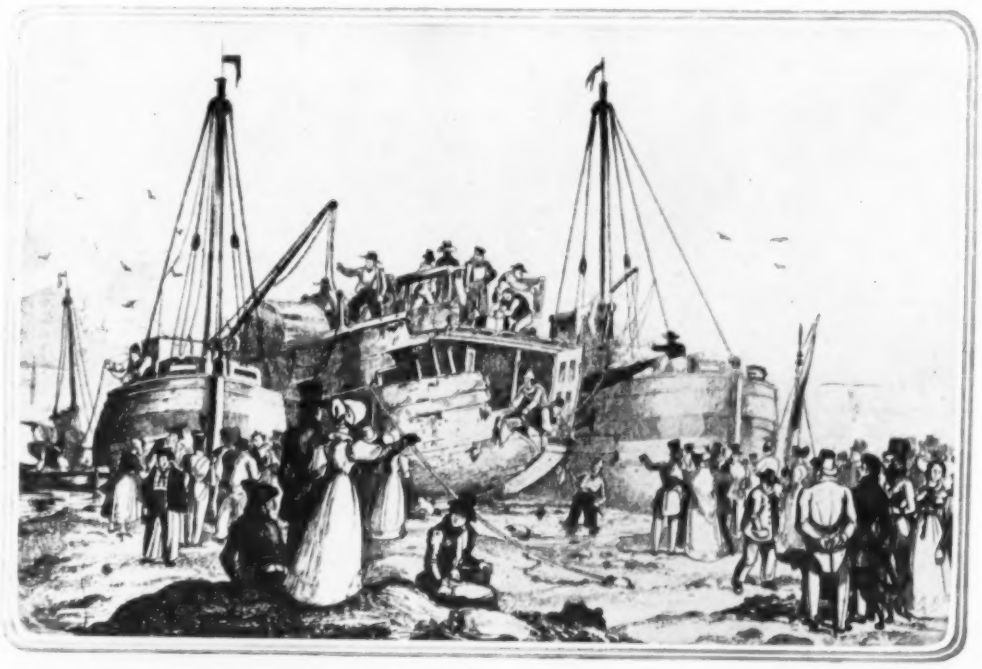
Bell derived no benefit from his first venture, and the loss of the second *Comet* brought him financial disaster. He was never in a position to pay in full either the builder or the maker of the engine of the first *Comet*, but, with great generosity, Wood did not press for a settlement. The Government were approached on several occasions to grant Bell a pension as a reward for his inestimable services, but without avail. After much solicitation, they granted him the paltry sum of £200. The Clyde Trustees, however, came to his aid, and, greatly to their credit, they first allowed him £50 per annum, which they shortly afterwards increased to £100 per annum, during his life, and graciously continued to his widow.

Henry Bell died at Helensburgh on Nov. 14, 1830, having lived for eighteen years after the birth of his famous *Comet*, to see the evolution of the result of his genius and perseverance. To his memory in his native village of Torphichen Mill there is a handsome tablet, and at Dunglass Castle, where the estuary of the Clyde widens out into a panorama of Highland loch and mountain, a noble obelisk has been reared: but the grandest memorial to the genius of Henry Bell is the modern steam-ship.



THE FIRST PRACTICAL STEAM-BOAT: AND A SHIP OF TO-DAY: THE "COMET": AND THE "COLUMBA," WHICH PLIES ON THE FIRTH OF CLYDE.

ERECTED IN 1838 AS A MEMORIAL TO THE "COMET'S" OWNER: THE HENRY BELL MONUMENT AT DUNGLASS POINT.

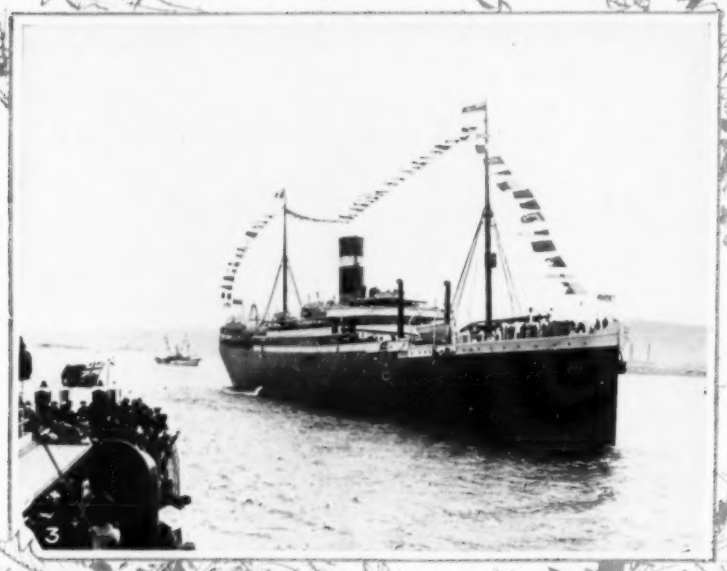


THE END OF THE SECOND "COMET": THE WRECK OF THE STEAM-BOAT ON THE SHORE AT GOUROCK.

The first "Comet," which traded by "the power of wind, air, and steam," was wrecked outside Crinan in 1820, while on her way from Oban to Glasgow. No lives were lost. The second "Comet," built in 1821, was lost by collision off Gourock in 1825. Seventy of the passengers were drowned.

THE CENTENARY OF THE "COMET": THE GLASGOW CELEBRATIONS.

PHOTOGRAPHS BY TOPICAL, ILLUSTRATIONS BUREAU, AND NEWS ILLUS.



1. DECORATED FOR THE CENTENARY OF THE LAUNCH OF THE "COMET": THE HENRY BELL OBELISK AT HELENSBURGH AS IT WAS DURING THE FESTIVITIES.
2. THE SECRETARY FOR SCOTLAND AND THE LORD PROVOST OF GLASGOW: MR. M'KINNON WOOD AND MR. D. M. STEVENSON AT THE CELEBRATIONS.
3. DRESSED FOR THE CENTENARY: THE LINER "GRAMPIAN" ON HER WAY DOWN THE CLYDE EN ROUTE FOR CANADA.
4. REPRESENTING THE "COMET": A CORPORATION CAR IN THE GUISE IN WHICH IT RAN THROUGH GLASGOW AT NIGHT, ILLUMINATED.
5. KEENLY INTERESTED IN THE CENTENARY: PROVOST JAMES FISHER, OF ROTHESAY, ORIGINATOR OF THE CELEBRATIONS, AND BAILIE JAMES M'MILLAN, OF ROTHESAY.
6. DESCENDANTS OF HENRY BELL: MR. HENRY BELL LOWE AND MR. PETER BELL LOWE, GREAT-GRANDNEPHEWS; MR. H. B. MACPHAIL AND MR. J. M. MACPHAIL GRANDSONS.

The programme of Glasgow's celebration of the centenary of the launch of Henry Bell's steamer, the "Comet," included the running of illuminated cars; a luncheon in the City Chambers; and an excursion to the Tail of the Bank to see the display of shipping, which included war-vessels, merchant-vessels, yachts and other craft. The whole affair was a great success and reflected much credit upon the organisers. In connection with the event, there is an excellent exhibition, in Kelvingrove Museum, illustrating the history and development of steam navigation. The collection includes: (1) Models of early experimental Steam-propelled Vessels: (2) Models of the earliest Steam-Vessels which plied commercially: (3) Models illustrating the progress of Steamship building in Tonnage, Power, and Speed: (4) Illustrations of the development and variations of Marine Engines including Turbines and other Motors and Marine Boilers: (5) Illustrations of history of Steam Power as applied to War-Vessels: (6) The development of Ocean Steamship Navigation: (7) Auxiliary Appliances connected with Marine Engines: (8) Pictures, Engravings, and Drawings relating to Steam Navigation and Naval Engineering: (9) Portraits and Personal Relics of Inventors and others.

THE CENTENARY OF THE LAUNCH OF THE STEAMER "COMET," AT GLASGOW:

PROMINENT ORGANISERS OF THE REJOICINGS IN HONOUR OF HENRY BELL'S ENTERPRISE.

CELEBRATING THE CENTENARY OF STEAM NAVIGATION ON THE CLYDE: MEMBERS OF THE EXECUTIVE COMMITTEE AND OTHERS.

The members of the Executive Committee of the "Comet" Centenary at Glasgow shown above are: Bailie James Stewart, River-Bailie Gardiner, Councillors George Carson, Thomas Dunlop, Robert Hunter, Bruce Murray, Andrew Macdonald, and Edward Watson; the Rev. Robert Barr, of Renfrewshire County Council; Provosts John Taylor, of Clydebank; McKechnie, of Govan; McMillan, of Greenock; A. M. M. G. Kidston, of Helensburgh; Councillor Robert Johnston and Mr. John Walker, of Kirkintilloch; Provost Thomas Stark Brown and Councillor Mollison, of Partick; Provosts William Fyfe, of Port-Glasgow; W. F. Anderson, of Renfrew; Fisher, of Rothesay (originator of the celebrations); Maguire, of Dunoon; Mr. Francis Henderson (Dean of Guild), of Glasgow Merchants House; Mr. A. G. Service (Deacon Convener), of Glasgow Trades House; Mr. E. Hall-Brown (President), of the Institution of Engineers and Shipbuilders of Scotland; Dr. A. L. Mellanby and Mr. H. F. Stockdale (Secretary), of Glasgow Technical College; Professors A. Barr and J. H. Biles, of Glasgow University; Captain J. C. Black, of the Mercantile Marine Service Association; Mr. Walter Dixon, President of the West of Scotland Iron and Steel Institute; Colonel John M. Denny, of Dumbarton; Mr. Alexander Gracie, of the Fairfield Shipbuilding Co., Govan; Mr. John Hamilton, of W. Beardmore and Co., Dalmuir; Mr. Thomas Bell, of John Brown and Co., Clydebank; Mr. W. G. Sharp, of the Boilermakers, Iron and Steel Shipbuilders' Society; Mr. T. H. Hill, of the Ship Constructive and Shipwrights' Association; Mr. Robert Neilson, of the Amalgamated Society of Engineers; and Mr. G. F. S. Shanks and Mr. George Laidlaw, of the Glasgow Trades Council. Portraits also appear on this page of Mr. John Inglis, LL.D., of the Committee of Clyde Navigation Trustees on Shipping Display; Councillor James Steele, Convener of the Museums and Art Galleries Sub-Committee; Mr. James Paton, Curator of Art Galleries and Museums; Mr. John S. Samuel, Private Secretary to the Lord Provost of Glasgow; and Mr. D. M. MacIntyre, Assistant to the General Manager and Secretary of the Clyde Navigation Trust.

Photographs (the majority) by Lafayette, Glasgow; others by Maull and Fox, H. W. Jones, Turnbull and Maunds, Hunter, Paterson, Annan and Sons, W. D. Brown, Whyte and Sons, Mitchell, Warwicks, Sharp, Ralston, Ivy Photo Co., and Colin Ramsay.

THE "COMET" CENTENARY: PIONEERS OF STEAM NAVIGATION:

AND MEMBERS OF THE HONORARY ADVISORY COMMITTEE OF THE CENTENARY EXHIBITION.

1. FOUNDER OF THE FIRST PASSENGER STEAM-BOAT SERVICE ON THE CLYDE: HENRY BELL.

2. DESIGNER OF THE "CHARLOTTE DUNDAS" IN 1801 AND EARLIER STEAM-BOATS: WILLIAM SYMINGTON.

3. AN EDINBURGH BANKER WHO SPENT A FORTUNE ON EXPERIMENTS WITH STEAM-BOATS: PATRICK MILLER.

4. THE FATHER OF THE STEAM-ENGINE, WHO AT FIRST DISCOURAGED HENRY BELL FROM APPLYING IT TO SHIPS: JAMES WATT.

Patrick Miller and William Symington, in 1788, tried a small steam-boat on Dalswinton Loch, and a larger vessel in the following year on the Forth and Clyde Canal. In 1802, on the same canal, appeared Symington's "Charlotte Dundas." Patrick Miller, of Dalswinton (1731-1815), was a friend and landlord of Robert Burns. William Symington (1764-1831), who was an engineer, was eventually ruined by his experiments with steam-boats, and died in poverty. James Watt at first discouraged the use of steam on ships, but, later, his firm—Boulton and Watt, of Birmingham—built the engines for Robert Fulton's "Clermont," placed on the Hudson in 1807. Henry Bell (1767-1830), of Helensburgh, was the pioneer of passenger steam-boats on the Clyde. His first "Comet" was launched on July 24, 1812. Round the border of this page are portraits of members of the Honorary Advisory Committee of the Centenary Exhibition—namely, Colonel Walter Brown, of the firm of William Simons and Co., Ltd.; Mr. Archibald Denny, of William Denny and Brothers; Mr. James Gilchrist, of Barclay, Curle, and Co., Ltd.; Mr. James R. Jack, M.I.N.A., of the Royal Technical College, Glasgow; Mr. Henry A. Mavor, M.I.C.E., of Mavor and Coulson, Ltd.; Mr. Edward H. Parker, Secretary of the Institution of Engineers and Shipbuilders in Scotland; Mr. John R. Richmond, of G. and J. Weir, Ltd.; and Mr. William Young, R.S.W., of Hillhead.

Portraits specially photographed by "The Illustrated London News": Photographs in the Border by Lafayette, Glasgow; and McIlwrick, Paisley.

A GREAT ENTERPRISE: THE RIVER CLYDE & THE PORT OF GLASGOW.

CHAIRMAN OF THE CLYDE NAVIGATION TRUST: SIR THOMAS MASON, J.P., D.L.
Photograph by Lafayette.

HEADQUARTERS OF A GREAT ENTERPRISE: THE CLYDE NAVIGATION TRUST CHAMBERS.

GENERAL MANAGER AND SECRETARY OF THE CLYDE NAVIGATION TRUST: MR. T. R. MACKENZIE.
Photograph by Annan.

IN Scotland there are no great rivers formed by the hand of Nature. In it, however, fervour is a characteristic, and where Nature has been illiberal in the making of streams she has been liberal in the endowing of men with intellect and determination. The river Clyde was, one hundred years ago, a "thing of beauty," but the commercial spirit of the city decreed that it was not to be a "joy for ever." In the beginning of last century there was at the Broomielaw one little quay, which haven was more often desired than attained, as small craft drawing two or three feet of water could only reach it through much tribulation. One hundred years of swiftly flowing time, and the scene is changed! The quays, then a few yards in length, are now eleven miles in extent, with deeply founded and solid walls, at which keels scarcely find bottom at forty feet, and from which a vessel may safely leave for sea with 12,000 tons of the products of industry.

SHOWING THE FINE CLYDE TRUST OFFICES, THE EAST END OF GLASGOW'S GREAT HARBOUR.

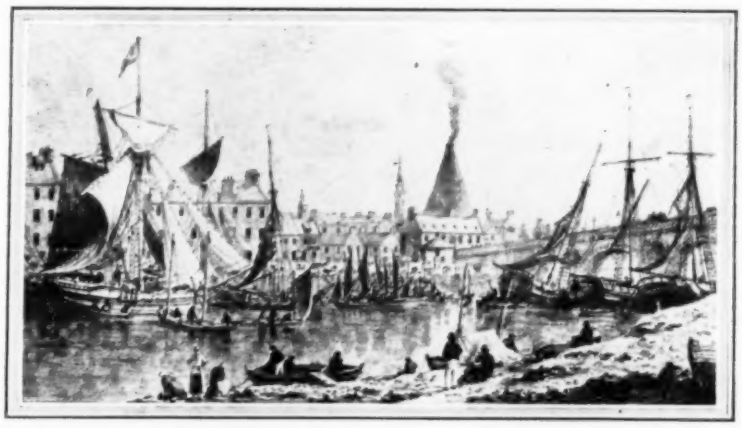
Photo. Annan.

"GLASGOW MADE THE CLYDE, AND THE CLYDE MADE GLASGOW": IN THE HARBOUR.

The Municipality of Glasgow were the pioneers in the improvement of the Clyde from Glasgow to the sea. In the beginning of the seventeenth century a few small vessels traded to Glasgow, but could not come nearer than Dumbuck—fourteen miles seawards. The river was narrow and tortuous, with several islands, and so shallow as to be in many places fordable. The methods adopted to clear the channel by means of such little money as was at the disposal of the Municipality were of the most primitive kind, and it was not until 1663 that any attempt was made to build a quay, which was so diminutive that the work was faced with timber from the "High Kirk or back gallery." The trade and requirements of the city, however, developed so rapidly that it was found necessary to seek some place below Dumbuck for the loading and unloading of goods, and in 1668 lands were acquired at Newark, eighteen miles from Glasgow, on which there was a small private harbour, and this harbour, with additions, came to be known as Port Glasgow. Here the principal trade of the Port was carried on. By the Union with England, the Colonies were opened up to commerce, when there was a considerable trade with Virginia. A vessel of sixty tons was built on the Clyde in 1718, which commenced the trade in tobacco for which Glasgow became famous; and the ensuing rapid development resulted in the Town Council, in the year 1722, proceeding with the construction of another quay near Glasgow Bridge.

In 1755, Smeaton, the engineer of the Eddystone Lighthouse, reported on the river, and following thereon the first Act of Parliament was obtained in 1759 for improving the navigation. In 1768, John Golborne, of Chester, reported that the river was in a state of nature, and a year later, a report was got from the famous James Watt. In 1781, Golborne reported again; in 1799, John Rennie was consulted; and in 1806, Thomas Telford; and, on the advice of those eminent engineers, further schemes of improvement were adopted. Their efforts in the training of the river by walls and jetties were so successful that in 1806 a vessel of 120 tons, drawing 8½ feet, reached Glasgow. The history of the navigation since has been one of unbroken prosperity, and the earnest work of the citizens and their advisers has been of incalculable value not only to Glasgow but to the trade of the world.

The affairs of the River and Port were managed by the Municipality until the beginning of last century, when the Council was formed, under an Act of Parliament passed in 1809, into a separate body as statutory trustees. They were empowered to convey to themselves the dues authorised to be levied, and also the quay and harbour itself, and to take over the responsibility of deepening and widening the river for the eighteen miles between Glasgow and the Firth, and of maintaining and improving the harbour. Since then various changes have been made in the Constitution. The number of "The Trustees of the Clyde Navigation" is now forty-two, ten being chosen by the Municipality, two each by the Chamber of Commerce, Merchants' House, and Trades' House of Glasgow, eight by the Counties and small towns on the river, and eighteen by the harbour-dues payers.



AS IT WAS IN THE YEAR OF THE LAUNCHING OF THE "COMET," THE FIRST STEAM-BOAT ON THE CLYDE: GLASGOW HARBOUR IN 1812.

The improving of the river is carried on constantly, and for this purpose the Trustees have dredgers capable of dredging in forty-eight feet of water and cutting their own flotation, and a large fleet of hopper barges for conveying the excavated materials to sea. The quays, which are, for the most part, solid walls founded on concrete caissons, are equipped with sheds varying from 60 to 100 feet wide, with lines connecting with the principal railway systems of the country. Besides the quays on the open river, there are four tidal basins, viz.; Kingston Dock, Queen's Dock, Prince's Dock,

SIGNS OF PROSPERITY: VESSELS IN THE SOUTH BASIN OF ROTHESAY DOCK.

VIEWED FROM THE ENTRANCE: QUEEN'S DOCK, A CENTRE OF MUCH COMMERCE.

Photo. Annan.

WITH A WATER AREA OF 35 ACRES: PRINCE'S DOCK, OPENED IN 1897 BY THE THEN DUKE AND DUCHESS OF YORK.

and Rothesay Dock, which comprise fully one-half of the whole quayage. The docks are available at all states of the tide, the range being only about ten feet. Rothesay Dock, with over a mile of quayage, chiefly for the ore and coal trade, is equipped with modern appliances entirely wrought by electricity, and in this respect is the only dock of its kind in the country. There are three graving docks: one 880 feet long; and the Trustees are about to construct another of such dimensions as will accommodate any vessel in H.M. Navy or in the Merchant Service, and will probably be the largest in the world. The

Photo. Warnecke.

DEPUTY CHAIRMAN OF THE TRUSTEES OF THE CLYDE NAVIGATION TRUST MR. W. H. RAEBURN.

Trustees are constructing a granary of the most modern kind to contain 31,000 tons of grain, with elevators and other appliances wrought by electricity for the rapid handling and the storage of grain.

In addition to special berths for the lines of steamers trading to all parts of the world, there is ample berthage for tramp steamers with grain, timber, and ore, and for the shipment of coal, iron, and the great variety of other goods, as well as facilities for fitting out merchant and war vessels. The Trustees have been unremitting in their efforts, not only to provide for the rapid handling of cargoes, but also to meet the requirements of the deep-draughted vessels of to-day; as steamers drawing twenty-eight feet may leave the quays two hours before high-water and reach the sea in one tide.

The huge steamers built on the Clyde have also to get to deep water. From the yard which bore the *Lusitania* will shortly be launched the Cunarder *Aquitania*, which will be over 900 feet long. The most powerful war-ships are launched safely from those famous ship-building yards, and lie afloat at all states of the tide.

The Trustees have spent in forming the river and harbour about ten millions sterling, seven of which have been borrowed, and the annual expenditure for maintenance and interest at present is over £500,000.

Glasgow is pre-eminently a manufacturing centre, and is surrounded by coalfields and ironworks. Of the articles of commerce dealt with annually at the Port the following are the principal; Exports—Coal, 4,107,427 tons; Iron and Steel, and Machinery, 859,905 tons; and Imports—Corn, Wheat, Flour, etc., 545,087 tons; Ores, Pig-Iron, and Limestone, 1,896,714 tons; Timber, 234,168 tons; and Fruits, 90,138 tons. Of the whole tonnage the exports form 60 per cent., and the foreign trade, 70 per cent.

In 1812 the Revenue from the dues of the Port was only £4600. Fifty years later, it was £111,000, and since then it has steadily increased until, for the year ended June 30 last, despite losses through labour troubles, it amounted to over £582,000. Fifty years ago the quayage did not extend more than two miles, and there was not a single dock; now it is eleven miles, and there are four docks.

Photo. Annan.

AS IT IS IN 1912, THE YEAR OF THE CELEBRATION OF THE CENTENARY OF THE "COMET'S" FIRST JOURNEY ON THE RIVER: THE CLYDE, VIEWED FROM THE SAILORS' HOME, GLASGOW.

ENGINEER OF THE CLYDE NAVIGATION TRUST: MR. W. M. ALSTON.

As recently as twenty years ago, the nett register tonnage of vessels using the Port in the year was 6,920,566; this year it was 12,220,538. The tonnage of goods was 4,896,817; now it is 9,524,062.

Much expense has been avoided by the foresight of the Clyde Trustees, as lands for dock purposes have been acquired at moderate prices; and they now possess 400 acres near Glasgow, having two miles of river frontage, on which will be formed not only the mammoth graving dock, but about six miles of quayage. The Trustees have always enjoyed public confidence, the splendid Port of to-day being eloquent of the wisdom of their management.

IN 1812, ONE LITTLE QUAY AT THE BROOMIELAW; IN 1912, ELEVEN MILES OF QUAYS: IN GLASGOW'S BUSY HARBOUR.

HONOURING THE DESIGNER OF THAT "SPLUTTERIN' THING," THE "

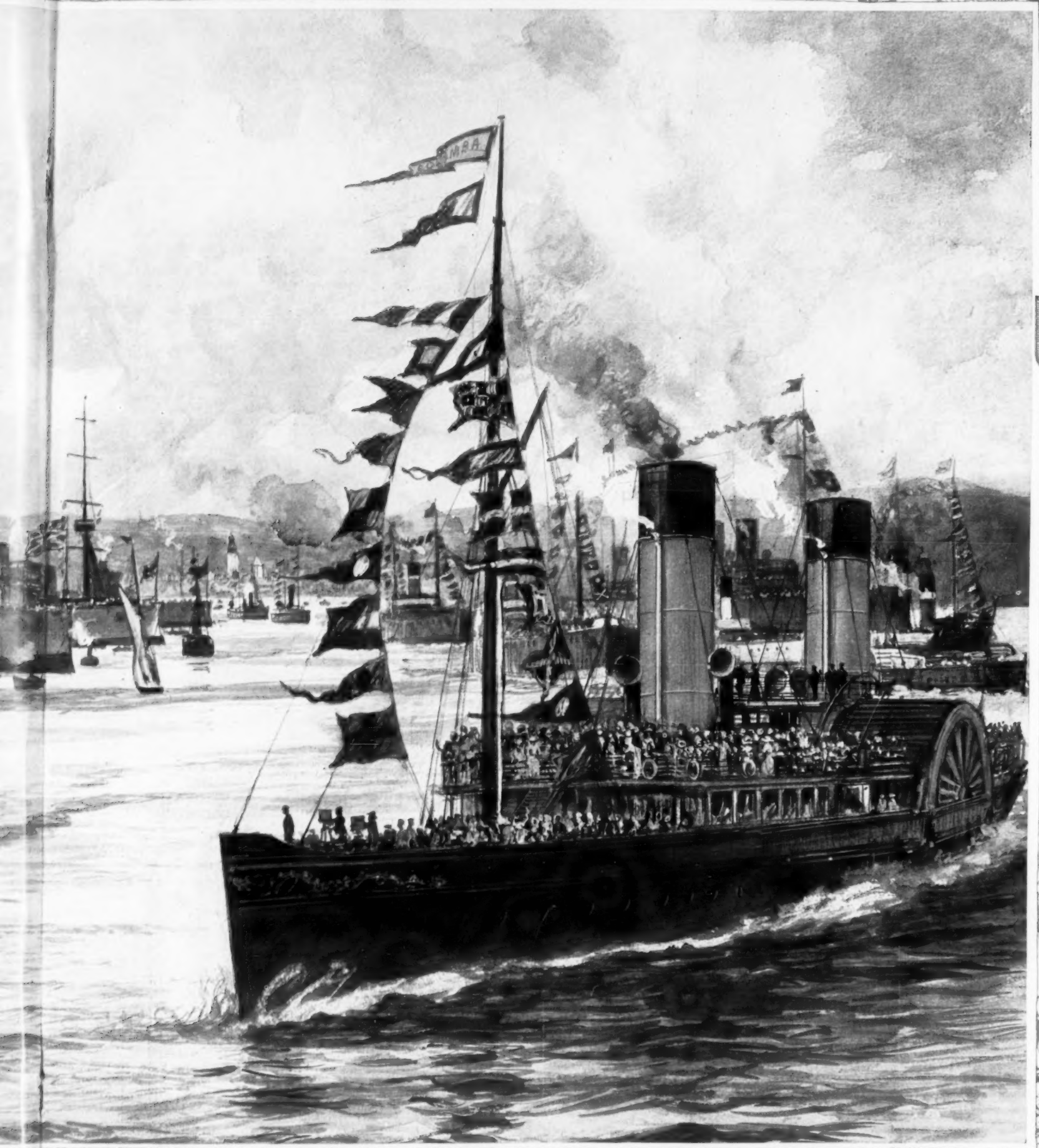
DRAWN BY CHARLES J. DE LACY, OUR SPECIAL A

GLASGOW'S RECOGNITION OF HENRY BELL, THE MAN WHO LAUNCHED THE FIRST STEAM-SHIP UPO

When an old "skipper" first saw the "Comet" on the Clyde he piped the whole of his ship's company—a man and a boy—on deck and said to them: "Kneel doon and thank God that ye sail with the Almichty's ain wind, and no' wi' the De'il's ain fire and brimstone like that splutterin' thing there." That was a hundred years ago. Last week Glasgow honoured Henry Bell, who was responsible for the "splutterin' thing," by keeping the centenary of the launch of the "Comet" with great rejoicings. August 31 was a general holiday in the Towns of the Clyde, and there was a very interesting display of shipping off the Tail of the Bank. To view this display the Royal Mail steamer "Columba," which had been placed at the disposal of the Centenary Executive Committee, set out at noon on a voyage of inspection with a distinguished company numbering several hundred. The trip was a striking revelation of the vast extent and scope of the Clyde shipbuilding industry, for every

THE "COMET": THE CENTENARY CELEBRATIONS ON THE CLYDE.

ACY, OUR SPECIAL ARTIST ON THE "COLUMBA."



SHIP UPON WATERS NOW WORLD-FAMOUS: THE SHIPPING DISPLAY AT THE TAIL OF THE BANK.

conceivable type of steam-ship was seen in the making, from great war-ships and liners down to little tugs and river craft. For instance, to mention only war-ships, at Messrs. Harland and Wolff's Yard at Govan were the Australian cruiser "Sydney," the Admiralty depot-ship "Woolwich," and three destroyers; in the Fairfield Company's yard the cruiser "New Zealand" and five destroyers; at Messrs. John Brown's yard at Clydebank the cruisers "Southampton," "Tiger," and "Australia," and several destroyers; at Messrs. W. Beardmore's yard the battle-ships "Conqueror" and "Benbow," the cruiser "Dublin," and two destroyers; and at Messrs. Yarrow's yard at Scotstoun more destroyers and three gun-boats. In the illustration are—on the left a liner, and then, from left to right, the flag-ship "Hercules," the "Colossus," the "Monarch," and the "Neptune"; in the right foreground is the "Columba."

THE ROMANCE OF A GREAT TRANSATLANTIC LINE.

CHAIRMAN OF THE ALLAN LINE STEAMSHIP COMPANY: MR. HUGH A. ALLAN.

Mr. Hugh A. Allan is the son of the late Mr. Andrew Allan, partner with his brother, the late Sir Hugh Allan, in Montreal. Mr. H. A. Allan is also a Director of the Grand Trunk Pacific.—[*Photo. by Lafayette.*]

MANAGING-DIRECTOR OF THE ALLAN LINE AT GLASGOW: COLONEL JAMES SMITH PARK, M.V.O.

Colonel James Smith Park is also principal owner and manager of the Park Steamship Company, Ltd., and Chairman of the Dominion of Canada Investment and Debenture Company, Ltd.—[*Photo. by Lafayette.*]

TWO years before the Battle of Waterloo, when the Duke of Wellington was campaigning in the Peninsula, a trim little brig named the *Hero* was engaged in conveying supplies to Spain for the Duke's forces. Her commander was Captain Alexander Allan, a young Scot, a native of Saltcoats, Ayrshire, who had early in life taken to a seafaring career, and had risen in the service by his own ability. The war being over, Captain Allan cast about for some new employment, and eventually, in 1819, built at Irvine the brigantine *Jean*, and the same year set sail in her from Greenock for Quebec with a view to opening up trade with Canada—then just beginning to attract the more adventurous spirits in the world of commercial enterprise. The first voyage of the *Jean* to Canada proved very successful, and the trade was so profitable that Captain Allan established a regular service of four large clipper packets, himself taking command of the *Favorite*.

Thus was inaugurated the service which developed into the famous Allan Line, the oldest of the North Atlantic steamship companies running to Canada At that time the navigation of the St. Lawrence, always difficult, was far more formidable than it is now, for the channel was badly lighted, and the pilots were frequently incompetent. There were no wharves then at Montreal: vessels had to be towed up St. Mary's Current by oxen, and cargoes unloaded by means of planks from the ships to the shore.

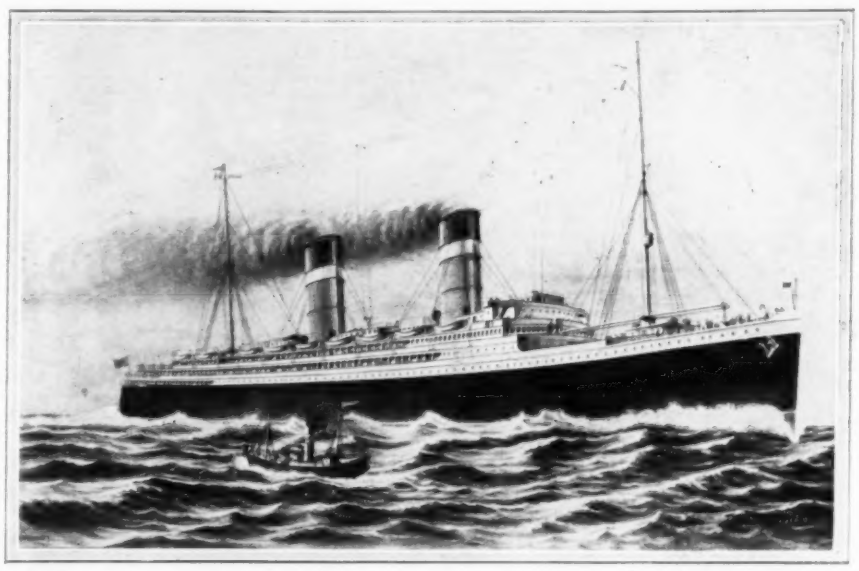
The perils and hardships of those days are described in a little booklet called "A Short History of a Great Steamship Company," written a year or two ago, by Mr. Randolph Carlyle. "Anyone," he writes, "however lacking in imagination, could form at least a moderate idea of what it meant for Captain Allan to surmount in his day, with his fragile wooden vessels, the same winds, the same ice-floes, and the same rocky coasts that in this twentieth century, against all the advantages of advanced engineering skill, sometimes make prey of the great leviathans of the deep." These words sound almost prophetic in the light of the disaster to the *Titanic*, and in that connection it may be recalled that two modern Allan liners—the *Virginian* and the *Parisian*—were among the vessels which caught the *Titanic's* wireless cry of distress, and immediately hastened to her aid, but were, unfortunately, too far away to be able to reach her in time.

To revert to early days—Captain Alexander Allan continued to command the *Favorite* until 1831, when he set up an office in Glasgow to promote the Canadian trade. He had five sons, the eldest of whom, James Allan, and another, Bryce Allan, commanded ships of their father's fleet. James and his brother Alexander succeeded to their father's business in Glasgow under the style of Messrs. J. and A. Allan. Captain Bryce Allan settled at Liverpool, where he was agent of the line for twenty years. Meanwhile, the second son, Hugh—afterwards so well known throughout Canada as Sir Hugh Allan—who was born at Saltcoats in 1810, had, as a boy of fifteen, sailed with his father in the *Favorite* to Montreal, landing there in May 1826. A few years later he became a partner in the firm of Millar, Edmonstone and Co., of Montreal, as also did his brother Andrew; and in 1860, when Mr. Edmonstone retired, the firm took its present name, that of Messrs. Hugh and Andrew Allan. Thus, of the five sons of Captain Alexander Allan, the founder, three were in the old country and two in the new, all being concerned in the growing interests of the Allan Line. The quintet of brothers continued to manage the great business for forty years. The most prominent of all, Hugh Allan, was knighted by Queen Victoria, in 1871, for his services to Canadian commerce. A similar honour was afterwards conferred by King Edward on Sir Hugh's son, the present Sir H. Montagu Allan. He and his brother, Mr. Bryce J. Allan, and their cousins, Messrs. Hugh A. Allan and Andrew A. Allan, sons of Mr. Andrew Allan, succeeded to the management when the elder generation passed away.

The shipbuilding as well as the personal side of the story of the Allan Line is also of remarkable interest. The first vessels were, of course, sailing-ships. They were small — from 350 to 450 tons — but fast, and specially built on the Clyde for coping with the spring ice in Canadian waters It was in 1852, a memorable year in the history of the firm, that sailing vessels were superseded by a service of iron-screw steam-ships. The Atlantic and St. Lawrence Railway, from Montreal to Portland, had just been completed, and Hugh Allan saw that their vessels could call at Portland in winter to connect with the new railway. Accordingly, the Allans and some other merchants formed the Montreal Ocean Steamship Company, and a contract was placed with William Denny, of Dumbarton, to build two iron steamers, the *Canadian* and the *Indian*.

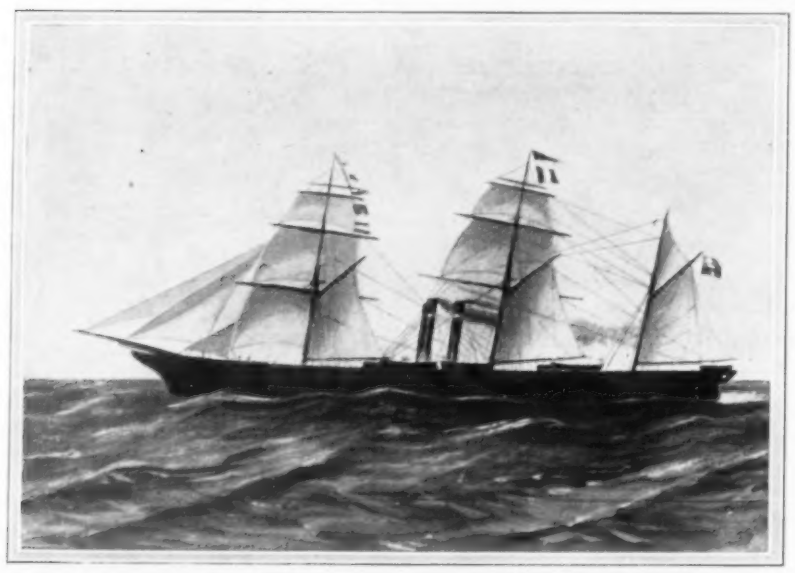
These vessels had a gross tonnage of about 1700 tons, with engines of 350 horse-power; they were barque-rigged, and cost some 250,000 dollars each; their speed was about eleven knots. These new boats were used as military transports during the Crimean War. In 1855 the Canadian Government made a contract with the Allans for the fortnightly conveyance of the mails, giving them a subsidy of 120,000 dollars a year, afterwards increased to 208,000 dollars, and later to double that sum for a weekly service. This naturally gave a great impetus to the line, and a number of new and improved steamers were built.

At first there were serious losses amongst the steamers running to the St. Lawrence, and insurance premiums became prohibitive. The Allans, however, did not despair, and eventually fortune turned, and for thirty-three years they lost only one ship, and that without loss of life. A memorable event in the evolution of the line was the introduction of turbine-engines in 1904, the first two boats thus fitted being the *Victorian* and the *Virginian*, each of 12,000 gross tonnage. The Allans were pioneers in putting the turbine theory into practice in ocean-going vessels. They were also the first to build an ocean steamer of steel, namely, the *Buenos Ayrean*, in 1881, and the first Transatlantic line to adopt bilge keels, in 1884, on the *Parisian*. The latest Allan liners are among the most comfortable passenger-vessels afloat. The firm is ever progressing, and a new addition to their large fleet, the *Alsatian* (illustrated on this page), is now being built by Messrs. W. Beardmore, at Dalmuir, and a duplicate steamer, the *Calgarian*, by the Fairfield Company, at Govan. In September 1909, the Canadian Allans bought out all the British shareholders save Colonel Smith Park, and have since carried on the line, with even greater success than in the past.



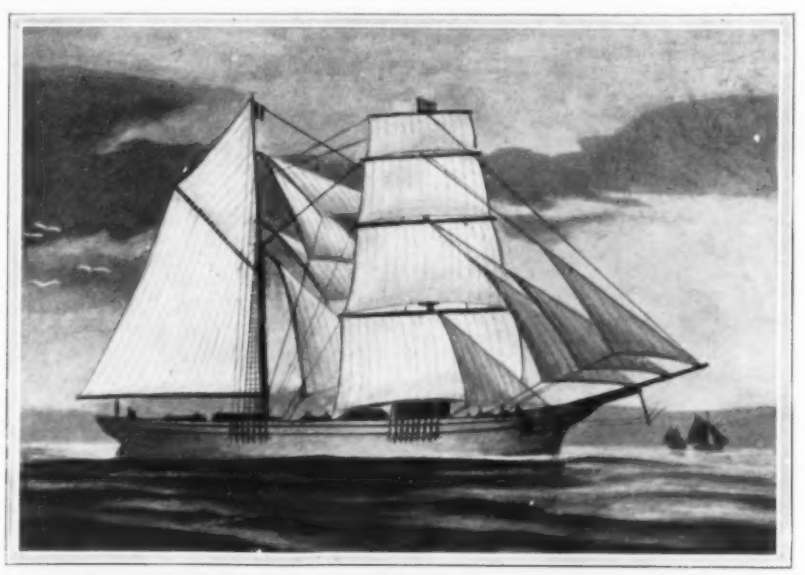
THE LATEST ADDITION TO THE ALLAN LINE: THE "ALSATIAN," AS SHE WILL BE WHEN COMPLETED IN THE SPRING OF 1913.

The "Alsatian," 600 feet long, 17,000 tons, and 18-knot speed, is now being built for the Allan Line by Messrs. W. Beardmore and Co., at Dalmuir.—[*From a Drawing by J. Ross Melville.*]



THE FIRST STEAM-SHIP OF THE ALLAN LINE: THE "CANADIAN," WHICH, WITH HER SISTER-SHIP THE "INDIAN," WAS PUT INTO SERVICE IN 1853.

The "Canadian" was a vessel of 1700 tons (gross). Her dimensions were about 270 ft. by 34 ft. She carried a large cargo and about eighty first-class passengers, with emigrants in the steerage.



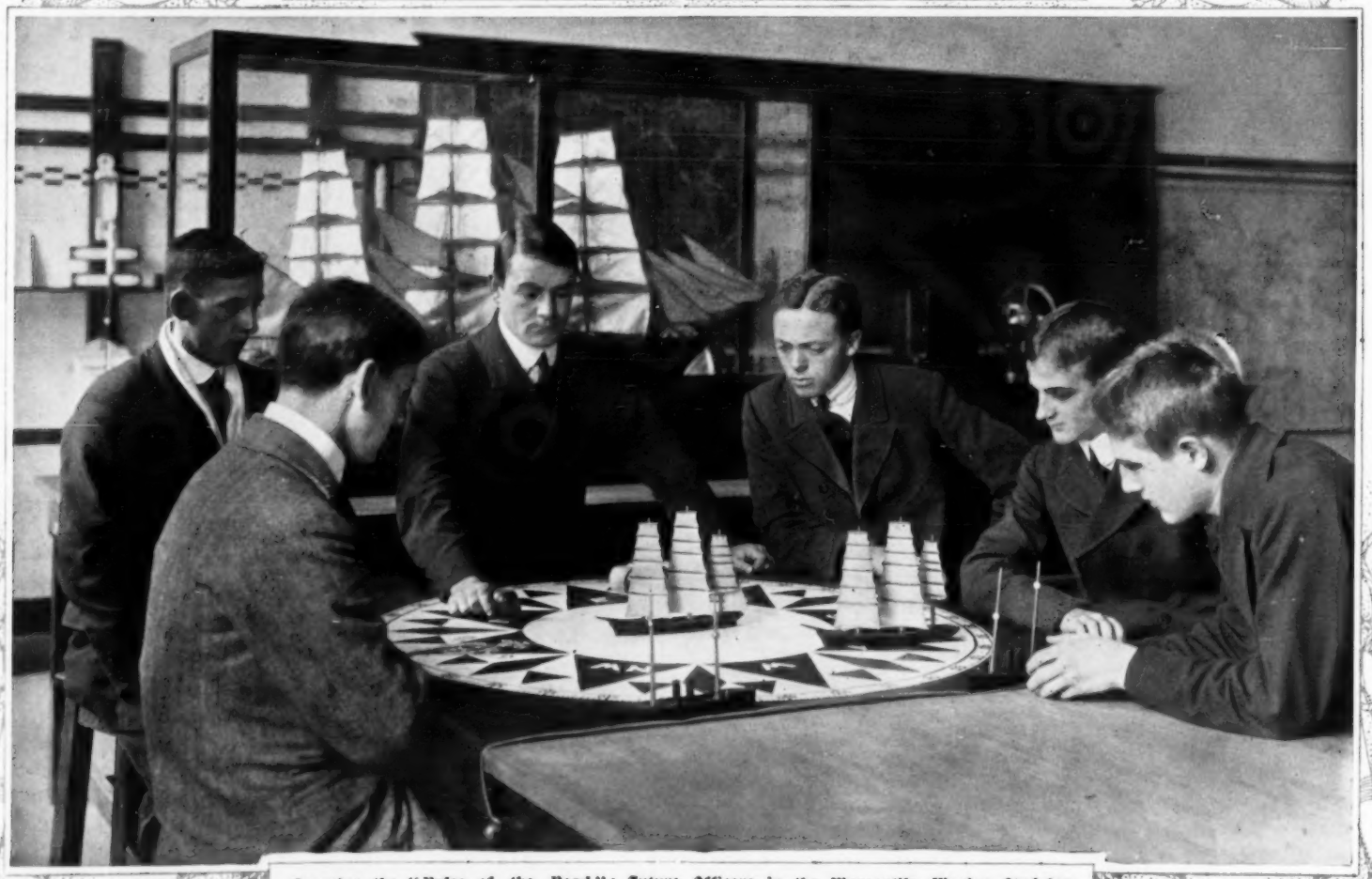
THE PIONEER VESSEL OF THE ALLAN LINE: THE BRIGANTINE "JEAN," IN WHICH CAPTAIN ALEXANDER ALLAN MADE HIS FIRST VOYAGE TO CANADA IN 1819.

The "Jean" was a little sailing-vessel of 169 tons. Her length was 76 ft. Captain Alexander Allan, the founder of the line, sailed in her from Greenock to Quebec in 1819.

THE SCIENTIFIC ROAD TO SEAMANSHIP: STUDY ON ROOF AND IN ROOM.

PHOTOGRAPHS SPECIALLY TAKEN FOR "THE ILLUSTRATED LONDON NEWS."

Learning How to Adjust a Ship's Compass for the Various Magnetic Forces Generated in the Steel Hull of a Vessel: Students Using the Deviascope, on the Roof.

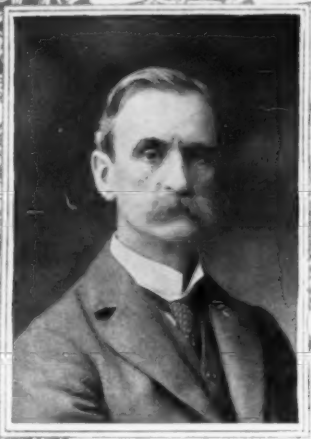


Learning the "Rules of the Road": Future Officers in the Mercantile Marine Studying their Profession with the Aid of Models and Special Compass.

FUTURE OFFICERS IN THE MERCANTILE MARINE LEARNING THEIR PROFESSION: CLASSES AT THE SCHOOL OF NAVIGATION OF THE ROYAL TECHNICAL COLLEGE, GLASGOW.

The photographs show future officers in the Mercantile Marine at work in the splendidly equipped and managed School of Navigation at Glasgow, which is fortunate in possessing several original and unique pieces of apparatus, in addition to those which are customary. Notable amongst the novelties is a large Deviascope mounted on the roof. This instrument, which consists of a revolving platform, mounted on a central axis, and operated by a steering-wheel and gearing, is designed for experimental work in adjusting a ship's compass for the various magnetic forces which are generated in the steel hull of a ship. The compass, which is the pattern designed by the late Lord Kelvin, who did more than any other scientist to simplify the practical work of navigating a ship, commands a complete sweep of the sky-line, which is an essential condition in accurately gauging the variable errors that affect the direction of the needle. The several fittings near the compass are of gun-metal, to eliminate as much as possible the erratic effects of extraneous metal, and to admit of delicate experiments being made. The students stand on the platform and are carried round with it as it revolves, so that the operation of "swinging ship" is made as nearly practical as is possible on shore.

THE SECOND CITY OF THE UNITED KINGDOM: GLASGOW.



THE HON. THE LORD PROVOST OF GLASGOW: MR. D. M. STEVENSON.
Photograph by Warnecke.

CONTAINING NEARLY TWO HUNDRED THOUSAND VOLUMES: THE MITCHELL FREE LIBRARY, IN NORTH STREET.

WHERE YOUTHS DESIRO'S OF MERCANTILE MARINE MAY NICAL COLLEGE, GLASGOW; SCHOOL OF

BECOMING OF TUDY: THE WHICH HAS NAVIGATION.

IN the sixth century Glasgow was deemed worthy to be the centre of the missionary activities of St. Mungo; in the twelfth its See was re-established, and a Cathedral was consecrated in it; in the fifteenth its University was founded; in the later part of the seventeenth it had gained recognition as of great commercial importance; at the time of the Union it had thirteen thousand inhabitants; in 1759, the Clyde was taken seriously in hand, in to the Bridge of Glasgow. A hundred years ago its people saw the first passenger-carrying steamer puff through her maiden journey on their river, and were interested mildly, but certainly were not vastly elated.

Since then Glasgow has made the Clyde and the Clyde has made Glasgow. And now the descendants of those who saw Bell come into his own have just celebrated the advent of the *Comet* a few months after having found themselves once again dwellers in the second city of the United Kingdom in regard to population, units of 1,007,600, as compared with the 840,372 of Birmingham, and the 746,560 of Liverpool. For this proud position they have to thank the situation of the city, the ability of their forebears and themselves, and the enterprise that has distinguished them and is made evident through their representatives, the Civic Fathers, who, as at present constituted, follow fine traditions with due respect, yet are ever ready to launch out and steer the craft of knowledge or of trade on new waters. Much is entrusted to them. They realise it, and do not shirk the duties it brings. Their city and its concerns are ever before them. They, in company with the Clyde Trustees and other bodies, were responsible for the celebrations which have just aroused so much interest on all sides, and footed the necessary bill. But that festival, after all, was comparatively a minor matter, save historically, a pageant of thanksgiving for prosperity, and an outward and visible sign of that excellent state.

It is to the scholastic and commercial affairs they control that chief homage must be paid; and it is well to note in that connection that the undertakings for which the Municipality is responsible rest on so sound a basis that taxation is exceptionally low. To this fortunate state of things the profits of the splendid tramways system, and of the electricity, gas, and water supplies, contribute largely. As continuation of inadequate schemes which had proved of little value in the two preceding centuries, and an Act of Parliament was obtained to "cleanse, scour, straighten, enlarge, and improve" the channel from Dumbuck Ford pioneers, the Corporation gave Glasgow its first tramway in 1872; in 1869 it took over the works of the Glasgow Gas Light Company, which in 1818 first supplied the city with gas, and those of the City and Suburban Gas Company, which began operations in 1843; in 1890 it commenced to supply electricity; water it took in hand officially in 1855, and constructed new works for tapping Loch Katrine, in the Perthshire Highlands, thirty-four and a-half miles from Glasgow Bridge. Now it is responsible also for art galleries and museums, public parks, libraries, hospitals, baths and wash-houses, quarries, farms, markets, slaughter-houses, foreign animals' wharves, and all those innumerable other items which go to the composition of a great and growing city. This, of course, to say nothing of the care of public health, of cleansing, of city improvements, of drainage, and many other things. With regard to its libraries, a word may be said. Its system consists of the Mitchell Library, which is the

Photo. Annan.
FOUNDED IN ACCORDANCE WITH A BULL OF AUTHORISATION ISSUED BY POPE NICHOLAS V. IN 1450: GLASGOW UNIVERSITY.

Photo. Annan.
HOME OF A COLLECTION BEGUN IN 1870, IN THE OLD MANSION HOUSE OF KELVINGROVE: THE KELVINGROVE ART GALLERY AND MUSEUM.

HEADQUARTERS OF GREAT AND FAR-REACHING CIVIC

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Photo. Lafayette, Glasgow.
THE TOWN CLERK OF GLASGOW: MR. JOHN LINDSAY, J.P.

Photo. Annan.
SOURCE OF THE MUNICIPAL WATER-SUPPLY: LOCH KATRINE, 34½ MILES FROM GLASGOW BRIDGE—THE ISLANDS.

Photo. Annan.
A CENTRE OF MUCH ACTIVITY IN A GREAT SCOTTISH CITY: CHARING CROSS, GLASGOW.

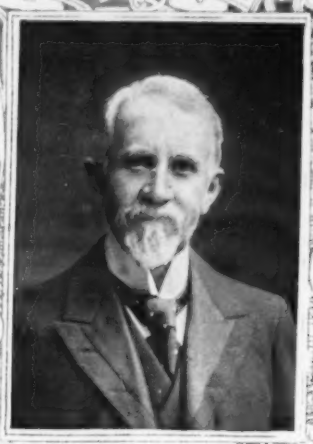
ITS MUNICIPAL ENTERPRISE & ITS PROSPERITY.

Photo. Annan.

BECOMING OFFICERS IN THE STUDY: THE ROYAL TECH- WHICH HAS A SPLENDID NAVIGATION.

Photo. Annan.

ONE OF NUMEROUS INSTITUTIONS MAINTAINING THE HEALTH OF THE PEOPLE: THE WESTERN INFIRMARY, GLASGOW.



A PROMINENT MEMBER OF THE CORPORATION OF GLASGOW: TREASURER KIRKPATRICK.

Photograph by Lafayette, Glasgow.

chief, and is the largest free library in Scotland; Stirling's Library, now in process of reorganisation; sixteen district libraries, including two in the making; and the Rankin Reading-room. Altogether these libraries contain over 400,000 volumes.

The sane spirit of the City Fathers is emphasised, too, in their recognition of the necessity for those open spaces it is now the fashion to call—with appropriateness—the lungs of the people. "The student of municipal history a century hence," it was written a few years ago, "will find the Public Parks of the city landmarks of a permanent character. . . . Fifty years ago the only public park was the Green. . . . Although the rapid growth of the city caused the more thoughtful to view with dismay and alarm the disappearance of open space and green field, under the invading march of the builder . . . it was not until 1852 that the civic conscience was awakened. . . . The purchase of the lands of Kelvingrove for the purpose of forming a public park marks an era in the history of the city." Glasgow cannot grumble on this score now, and its open spaces vie with its architecture, its air of keen business, its obvious interest in the arts, and its splendid harbour and docks, in attracting and holding the attention not only of the native, but of the visitor from all parts of Great Britain and abroad. Of a certainty, it is very well served by its sons.

Mention must be made, too, of the School of Navigation of the Royal Technical College — for Glasgow is, above all, a great Port. The value of this cannot be overemphasised; and the course of study for youths desirous of becoming officers in the Mercantile Marine is as thorough as it is practical. Included in the subjects are: navigation, nautical astronomy, seamanship, signalling, ocean meteorology, compass deviation, naval architecture, descriptive engineering, and shipping law. The laboratories are well supplied with models and appliances for demonstrating the mechanics of seamanship, while a complete set of meteorological instruments is augmented by the weather forecasts, which are received daily from the London Meteorological Office. The equipment includes signalling apparatus and a Marconi wireless installation. The astronomical observatory is equipped with the "Dansken" equatorial telescopes—a 13-in. Newtonian reflector, a 6-in. refractor, and a 2¾-in. transit instrument.

For the rest, it must be reflected that Glasgow must give much credit to the individual. To quote a few lines from a Handbook issued a while back by the Corporation: "What Glasgow—what the world—owes to the discoveries and inventions of James Watt, of Joseph Black, and of Lord Kelvin, it is impossible to estimate; and after these come a host of men who in a more limited manner contributed to the prosperity of Glasgow and to the benefit of mankind. Among the most prominent there occur at once the names of David Dale, herd boy, hawker, manufacturer, turkey-red dyer, banker, and evangelist (father-in-law also of Robert Owen); in chemical industries there were Charles M'Intosh, Charles Tennant, and Walter Crum; in the iron trade, Mushet, Beaumont Neilson, John Wilson, and the Baird family; in shipbuilding and engineering, Robert Napier, John Elder, and James Reid; in navigation, Henry Bell, David Napier, and George Burns." To whom should be added a succession of City Fathers whose records are writ large over Glasgow, in its beauties, its health, its arts, its crafts, and its prosperity.

Photo. Annan.

PLEASANTLY SITUATED ON BOTH BANKS OF THE KELVIN, AND RUN BY THE CORPORATION SINCE 1891: THE BOTANIC GARDENS, GLASGOW.

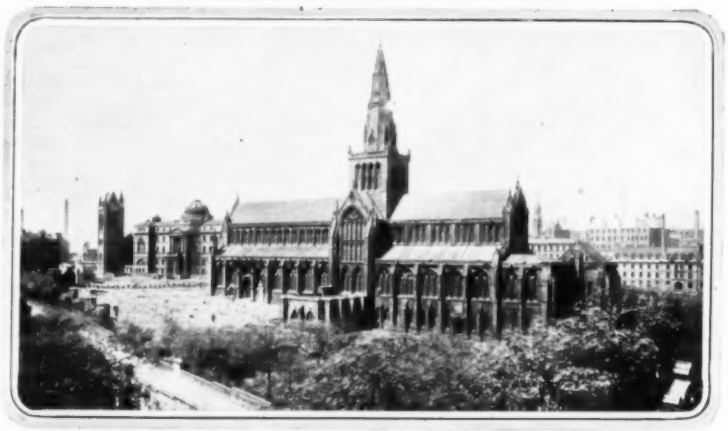


Photo. Annan.

ON THE SITE OF A CHURCH ERECTED IN THE SIXTH CENTURY BY ST. MUNGO: THE FINE PRE-REFORMATION GOTHIC CATHEDRAL.

Photo. Fullarton.

NTERPRISE: THE MUNICIPAL BUILDINGS, GLASGOW.

Photo. Annan.

FORMERLY CONNECTED WITH THE EAST END OF THE TOLBOOTH: TRONGATE, GLASGOW — A BUSY THOROUGHFARE.

Photo. Annan.

IN ONE OF THE FINEST OF GLASGOW'S MANY EXCELLENT "LUNGS": QUEEN'S PARK PONDS.

Photo. Smith, Giffnock.

FATHER OF THE GLASGOW TOWN COUNCIL: EX-TREASURER ROBERT GRAHAM.

A RECORD OF CONTINUAL GROWTH:
THE PROGRESS OF THE CLAN LINE.

Photo. Jacolette.

FOUNDER AND CHAIRMAN OF THE CLAN LINE: SIR CHARLES CAYZER, BT.

THE story of the Clan Line of steamers is a record of rapid and richly deserved progress. Established in 1878 by that well-known expert in shipping matters who is now Sir Charles Cayzer, Bt., of Gartmore, Co. Perth, it was at first an affair of half-a-dozen vessels, designed to trade between this country and Bombay. In the year of its foundation, in fact, it was represented by but two steamers afloat, and it was only in 1879 that the six were in service. That was a sufficiently humble beginning; but it opened the way to much business. In 1880 the Line still had the six ships, with a gross tonnage of 12,507. In 1881, it had eleven with a gross tonnage of 23,730; in 1882, twenty-two, gross tonnage 53,564; from 1883 until 1887, twenty-five, gross tonnage 70,483; from 1888 until 1890, twenty-four, gross tonnage 68,058; in 1891, twenty-seven, gross tonnage 73,606; in 1892 and 1893, twenty-eight, gross tonnage 75,874; in 1894, thirty-one, gross tonnage 83,036; in 1895, thirty-two, gross tonnage 86,242; in 1896, thirty-seven, gross tonnage, 99,642; in 1897, thirty-five gross tonnage 106,397; in 1898, thirty-five, gross tonnage 110,517; in 1899, thirty-nine, gross tonnage 132,519; in 1900, forty-four, gross tonnage 152,824; in 1901, forty-five, gross tonnage 157,349; in 1902, forty-four, gross tonnage 162,533; in 1903, forty-eight, gross tonnage 185,031; in 1904, fifty-one, gross tonnage 202,782; in 1905, forty-six, gross tonnage 187,930; in 1906, forty-five, gross tonnage 183,805; in 1907, forty-eight, gross tonnage 198,803; in 1908, fifty, gross tonnage 206,212; in 1909 and 1910, forty-nine, gross tonnage 202,622; in 1911, fifty-six, gross tonnage 237,552; and at the present moment, fifty-eight, gross tonnage 249,000.

It was in 1881 that the service from Glasgow and Liverpool to South African ports was inaugurated; a year later came the first sailings of a new service from Glasgow and Liverpool to Colombo, Madras, and Calcutta. Subsequent years saw a great extension of the Line's operations, and regular services are maintained from Glasgow and Liverpool to Bombay, Malabar Coast ports, Colombo, Madras and Calcutta, Chittagong, South Africa, and to East Africa, via the Suez Canal, whilst from New York a regular service to South Africa is also kept up.

The Clyde has received orders for two additional steamers, which are to be ready in 1913, and will bring the gross tonnage to about 260,000. The vessels added in 1911 and this year were built for the Australian trade, and are exceptionally fine, being about 450 feet in length, of the shelter-deck type, and having clear holds for the carriage of bulk cargo. Further, several of them are fitted for the conveyance of refrigerated cargoes. Two of them, the *Clan Macnaughton* and *Clan Macphee*, have recently shown their power by completing the voyage from Fremantle to Calais in thirty-one and thirty-two days, respectively, thus setting up records for cargo-boats from Australia; while the *Clan Macrae* discharged in London the other day, in exceptionally fine condition, the first cargo of Tasmanian apples.

The head office of the Company is at Glasgow. Sir Charles Cayzer, the founder, is Chairman both of the Clan Line Steamers, Ltd., and of the Manager's firm, Cayzer, Irvine, and Co., Ltd., who have branches in London, Liverpool, and Manchester. Further, he is a Justice of the Peace, and Honorary Colonel of the 3rd Lowland Brigade, Royal Field Artillery. From 1892 to 1906 he sat as Member of Parliament for Barrow-in-Furness, the first Conservative who had ever represented that constituency.

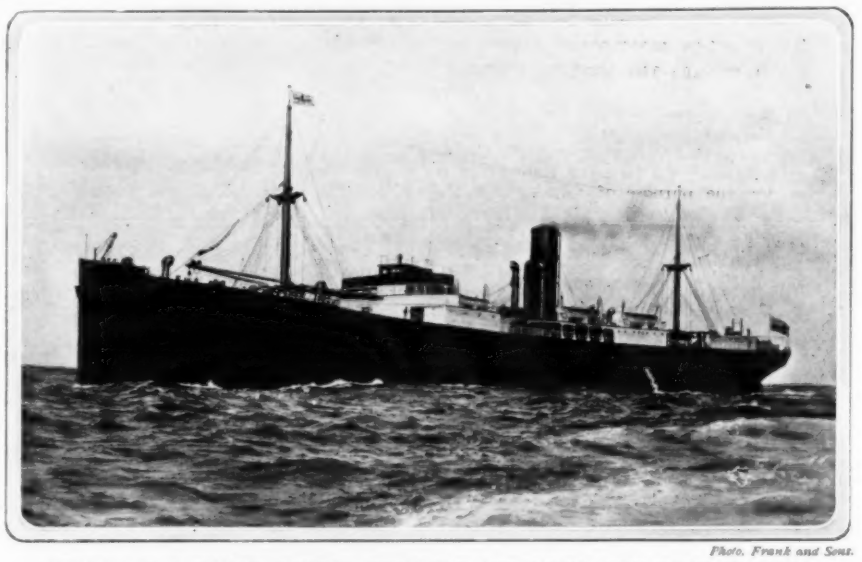


Photo. Frank and Sons.

CREATOR OF A RECORD BETWEEN FREMANTLE AND CALAIS: THE "CLAN MACPHEE."

The "Clan Macnaughton" and "Clan Macphee" recently set up a record for cargo-boats from Australia by completing the voyage from Fremantle to Calais in thirty-one and thirty-two days respectively.

A FIRM FAMED IN GLASGOW & ABROAD:
GOW, HARRISON, & Co.

PARTNER IN MESSRS. GOW, HARRISON, AND CO.: MR. LEONARD GOW, J.P.

Photograph by Annan.

PARTNER IN MESSRS. GOW, HARRISON, AND CO.: MR. JOHN R. HARRISON.

Photograph by Lafayette.

THE firm which bears the style of Gow, Harrison, and Co. rests on the firmest of foundations—age, and the experience which comes with it. Some seventy-two years ago, Allan C. Gow and Co. was inaugurated, based on an old family shipping business. Fifteen years afterwards, Mr. Allan C. Gow died, and was succeeded, as senior partner, by Mr. Leonard Gow senior, who, with Mr. James McGregor, started the Glen Line of steamers, trading between London, the Straits, and China. This was a year after the Suez Canal was opened; and for many a year to follow, when the China tea race was still one of the features of the shipping business, the firm's vessels had the honourable distinction of bringing in the first new season's teas from the Celestial Kingdom. With Allan C. Gow and Co., the present Mr. Leonard Gow and Mr. John R. Harrison worked for a good space; then the latter, who served his apprenticeship in a shipbroker's office at Newcastle-on-Tyne, joined the firm of P. H. Dixon and Harrison, ship-owners and brokers and insurance agents. Later, soon after the death of his partner, Mr. Harrison amalgamated his interests with those of Mr. Leonard Gow junior; and thus 1895 saw the two former colleagues sole partners in the company which has won such high rank, acts as ship-owners, ship-brokers, coal-exporters, and insurance brokers, and manages a fleet of seventeen high-class cargo-steamers.

Mr. Harrison, it may be noted, is a Director of Lloyd's Register of Shipping, Bureau Veritas, ex-President of the Clyde Steamship Owners' Association, President of the Cumberland and Westmoreland Association of Glasgow, and a Director of the *Empress* training-ship. It may be added, too, as a matter of more than common social interest, that three years ago he purchased the Scalesceugh Estate, a property attractive as having been owned by members of his family for over two hundred years.

Mr. Leonard Gow comes, as has been indicated already, of a family long noted in the city of St. Mungo. His father, Mr. Leonard Gow, LL.D., J.P., was a prominent figure in the public and commercial life of Glasgow for over half a century, and not only a successful shipowner, but a philanthropist who did much for his less fortunate fellow-citizens. His great-grandfather, James Carswell, built a very considerable part of the Royal Exchange district of the city, so the present Mr. Leonard Gow has unusual traditions behind him: that he has followed them worthily is very evident. His interests are many: he is a J.P., a director of the North of England Protecting and Indemnity Association, the Glasgow Shipowners' Association, the Glasgow Shipowners' and Shipbrokers' Benevolent Association, the Sailors' Home, the Canal Boatmen's Friend Society, the Glasgow Seamen's Friend Society, treasurer of the Glasgow Branch of the Royal National Lifeboat Institution, and a member of the general list of managers of the Glasgow Savings Bank. Mr. W. G. Forsyth and Mr. William McInnes, who for many years have been identified with the business, are junior partners of the firm. Such is the flourishing and ever-growing business of Gow, Harrison, and Co.

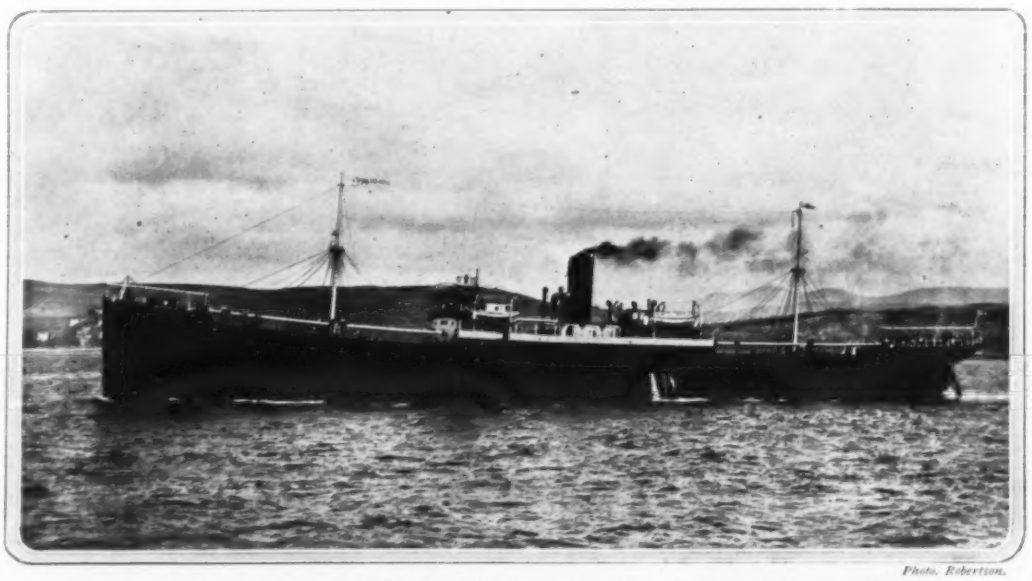


Photo. Robertson.

OF THE FLEET MANAGED BY GOW, HARRISON, AND CO.: ONE OF THE FIRM'S FINE STEAMERS.

Messrs. Gow, Harrison, and Co. manage seventeen high-class steamers, and are ship-owners, ship-brokers, coal-exporters, and insurance brokers.

A FAMOUS SHIPPING FIRM: THE DONALDSON LINE.

SCOTTISH MUSIC ABOARD A DONALDSON LINER: AN EMIGRANT PIPING ON DECK.

SETTING OUT FOR CANADA: PASSENGERS LEAVING PORT ABOARD A DONALDSON LINER.

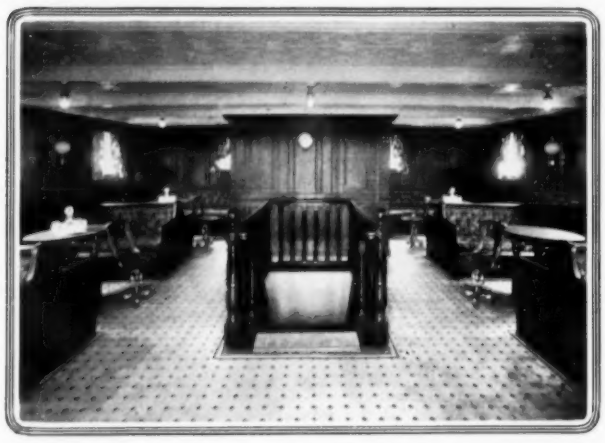
IN 1855, the port of Glasgow saw the birth of the firm of Donaldson Brothers, owners of the Donaldson Line; and, like most other shipowners of that time, the original founders, Messrs. William F. Donaldson and John Donaldson, opened offices in what was then the shipping quarter of the town, Buchanan Street. William F. Donaldson is now represented, it is interesting to remark, by two of the present partners in the firm, his sons, Messrs. William B. Donaldson and N. P. Donaldson; and John Donaldson by his sons, Messrs. William C. Donaldson and Charles Donaldson.

In 1858, with the little wooden barque *Joan Taylor*, of 299 tons, the Donaldson Line inaugurated its service between Glasgow, Liverpool, and South America. The next ten years witnessed additions to the fleet in the shape of the sailing-vessels *Mary Falconer*, *Margaret Falconer*, *Parana*, *Maranon*, and *Imuncina*.

Iron at this time was gradually displacing wood in ship-construction, and the building of the composite sailing-vessel *Colorado* was the Line's first venture in other than wholly wooden vessels. A still further advance in building construction was marked by the launch of their first iron vessel, the barque *Miami*, of 498 tons, in 1867. Further additions to the fleet in the next few years were the *La Plata*, *Uruguay*, *Santona*, *Chilian*, and *Peruvian*. Hitherto Donaldson Brothers had contented themselves entirely with a fleet of sailing-vessels, but with the building of the s.s. *Astarte*, of 863 tons, in 1870, they took the first step towards what was to prove the relinquishing of the sailing-vessel for the steamer, this vessel being followed by the s.s. *Marina*, *Cybele*, *Colina*, *Eirene*, *Cynthia*, and *Titania*.

AS IT WAS IN THE DAYS OF THE SAILING-SHIP: THE DONALDSON LINER "MARANON" OF THE MIDDLE NINETEENTH CENTURY.

It would be superfluous to trace the growth of the Company down to the present time. Sufficient is it to state that in the year 1876 they made their first entrance into the port of Montreal, dispatching the s.s. *Colina* with a general cargo. This voyage had far-reaching effects. So favourably impressed were they with Canada and with the advantages of Montreal over other Canadian ports, that the voyage was repeated, and in the course of time ultimately led to the establishment of regular "Liner" sailings to Montreal in the summer months. Montreal became then, and has continued since to be, the chief port of call for the Donaldson Line in the summer time, a weekly sailing being maintained from the middle of April until the beginning of November. For their sailings in winter the Donaldson Line has tried a number of ports in Canada, but in the last few years the advantages, geographical and otherwise, of St. John, New Brunswick, have so manifested themselves that this port has become the winter port of call, and a regular weekly sailing has for some years been in institution. In addition, in the summer months, a three-weekly service is also maintained to this port. About the year 1887, the Line made Baltimore in the State of Maryland the chief port of call in the United States, and, with the vessels of their own fleet, they have given a splendid service to that port, and also a few years later inaugurated a service to Newport, New Virginia, and have maintained both connections down to the present time.

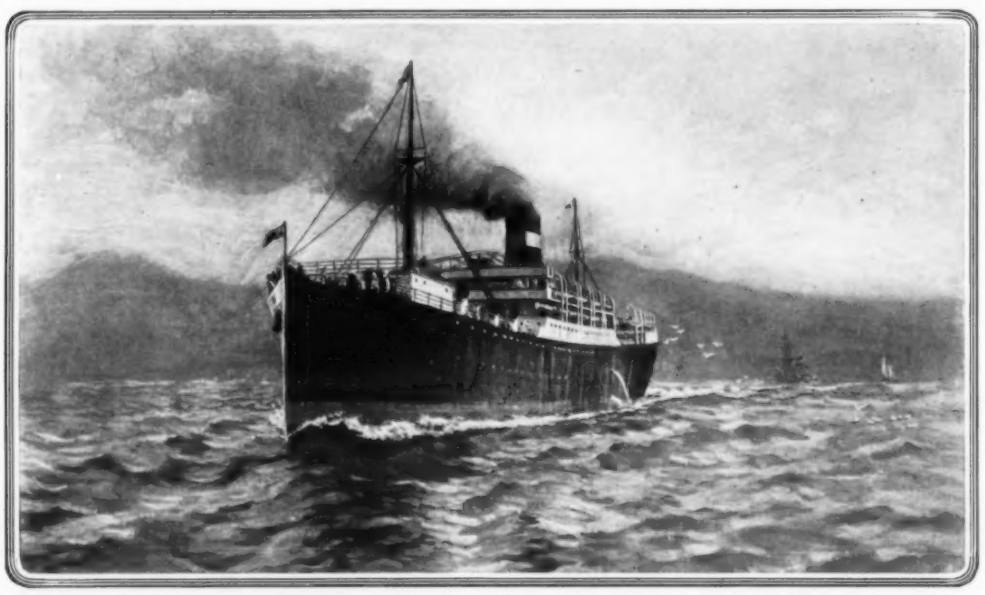


ON THE DONALDSON LINE'S NEW TWIN-SCREW STEAMER "LETITIA": THE SMOKING-ROOM.

Although the Donaldson Line had always made it their first aim in business to bring their steamers absolutely up to date for the carriage of live stock and all classes of freight, yet it is only within recent years that they turned their attention towards the passenger business. In 1904 it was felt that the time had come when the Line should take the place in the Canadian passenger trade which their long connection with Canada warranted; and with this end in view they built the new twin-screw passenger-steamer *Athenia*, of 10,000 tons, with accommodation for about 280 second-cabin and about 400 third-class passengers. An immediate success met their enterprise. The *Athenia* stepped into instant popularity, not only with the emigrant classes, but with the many representatives of British and Canadian firms whose business compels them to make frequent trips across the Atlantic. The *Athenia* made her maiden trip in the passenger trade in March of the year 1905, and has maintained a regular passenger sailing to the present time. Her success encouraged the firm to progress in the passenger trade, and in the month of June 1906 they launched from Messrs. Scott's Ship-building and Engineering Co., Ltd., Greenock, the t.-s.s. *Cassandra*, of 10,000 tons; in the early part of 1910 added the twin-screw steamer *Saturnia*, of 10,000 tons, built by Messrs. Charles Connell and Co., Ltd., Whiteinch; and in the present year, with the acquisition of the t.-s.s. *Letitia*, of 10,000 tons, built by Messrs. Scott, they have a regular weekly passenger service to Canada all the year round.

HEADQUARTERS OF A FAMOUS SHIPPING FIRM: THE GLASGOW OFFICES OF THE DONALDSON LINE, 56 AND 58, BOTHWELL STREET, GLASGOW.

The Donaldson Line, from the very commencement of their passenger service, recognised that the predominating demand was for second and third class accommodation. They have accordingly built all their steamers for these classes only. No first-class passengers being carried, second-class accommodation has been erected in the steadiest part of the steamers—viz., amidships, and, in consequence, promenade decks, etc., for second-cabin passengers are particularly extensive. Cabins are fitted up for two and four persons, and the appointments, fittings, and furnishing of these are on the most modern lines. No effort also is spared to make the ocean journey not only a necessity to some, but a pleasure to all. Large recreation-rooms, smoking-rooms, music-rooms, ladies' rooms, on all steamers, all play their part with this end in view. The Donaldson Line have taken a prominent part in greatly improving the lot of the Atlantic third-class passenger. The British emigrant above everything else desires privacy on board steamer; wishes, if at all possible, to be berthed with friends, or, if a married man, with his wife and family. All third-class accommodation on the Donaldson Line is in cabins, there being no open-berth steerage, and a special feature is that the *Cassandra*, *Saturnia*, and *Letitia's* accommodation is mostly in two and four-berth rooms.



ONE OF A FLEET OF TWELVE VESSELS OF A TOTAL TONNAGE OF ABOUT 100,000: THE DONALDSON LINE'S "CASSANDRA."

Each of their passenger-steamers has accommodation for about 300 second-class passengers, and, with the exception of the *Athenia*, all are fitted for about 1000 third-class passengers. The Line's passenger-steamers are all equipped with a complete installation of the Marconi system of wireless telegraphy (two operators being carried, so that steamers may always be in touch with other Lines, and with the land stations), are lit throughout by electric light, have boat accommodation for every soul on board, and are fitted with bilge keels to prevent rolling.

The Donaldson Line fleet consists of twelve vessels, of a total tonnage of about 100,000. Bothwell Street is now the recognised shipping district in Glasgow, and in one of the finest buildings in that street are the Head Offices of the Line.

HOW THE ENGINEER OVERCOMES HIS MOST STUBBORN OPPONENT:

OF STEEL SIMILAR TO THAT USED FOR ARMOUR-PIERCING PROJECTILES: ROCK-CUTTER POINTS—WORN (ON THE LEFT) AND NEW.

For each quality of rock there is a certain hardness and style of point which is the most suitable. The points are made harder in the centre than on the outside, and they remain automatically sharp if the rock is of an abrasive nature, such as sandstone.

THE most stubborn and intractable substance with which the engineer has to deal in the construction of harbour works or the dredging of canals and rivers is, naturally, rock. Until a few years ago, sub-aqueous rock was broken by drilling and blasting, but that process was slow and costly, particularly in the case of the harder kinds of rock, which necessitated the use of diamond drills. Moreover, the explosives often blew the rock into pieces too large to be readily removed by dredging, and it was a matter of great difficulty to dispose of them. Again, the process of blasting was very inconvenient to any adjacent shipping.

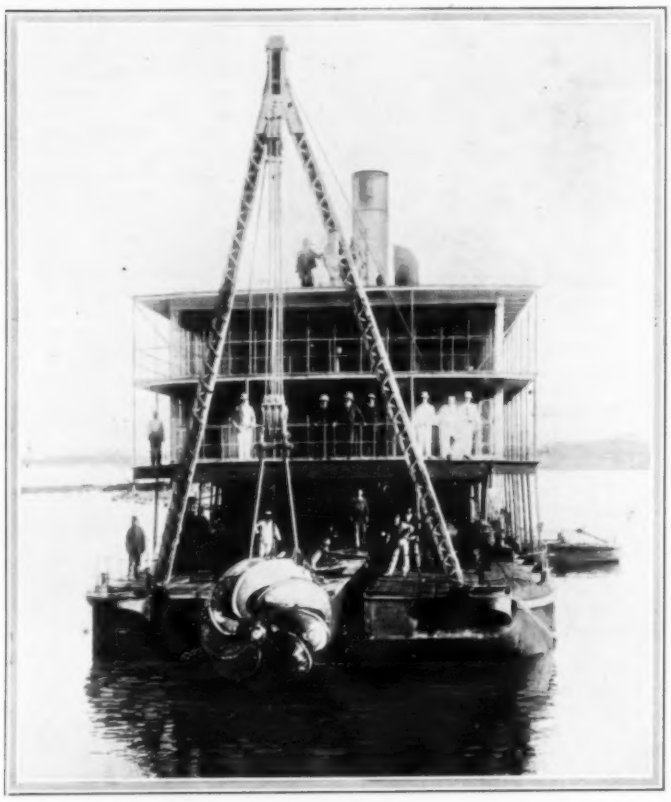
FATHER OF THE PRESENT HEAD OF THE FIRM: THE LATE MR. H. C. LOBNITZ.

Photograph by Stuart.

All these difficulties have been overcome by modern machinery of the type made by Messrs. Lobnitz and Co., Ltd., Shipbuilders and Engineers, at whose works at Renfrew, on the Clyde, six miles below Glasgow, is constructed the Lobnitz patent Sub-Aqueous Rock-Cutting Plant, and every kind of dredging apparatus. Messrs. Lobnitz, indeed, claim to be the largest firm in the world in their own particular line. Their works at Renfrew cover fifteen acres, and are equipped with the most modern machinery and the most powerful tools and appliances. The motive power throughout is electricity.

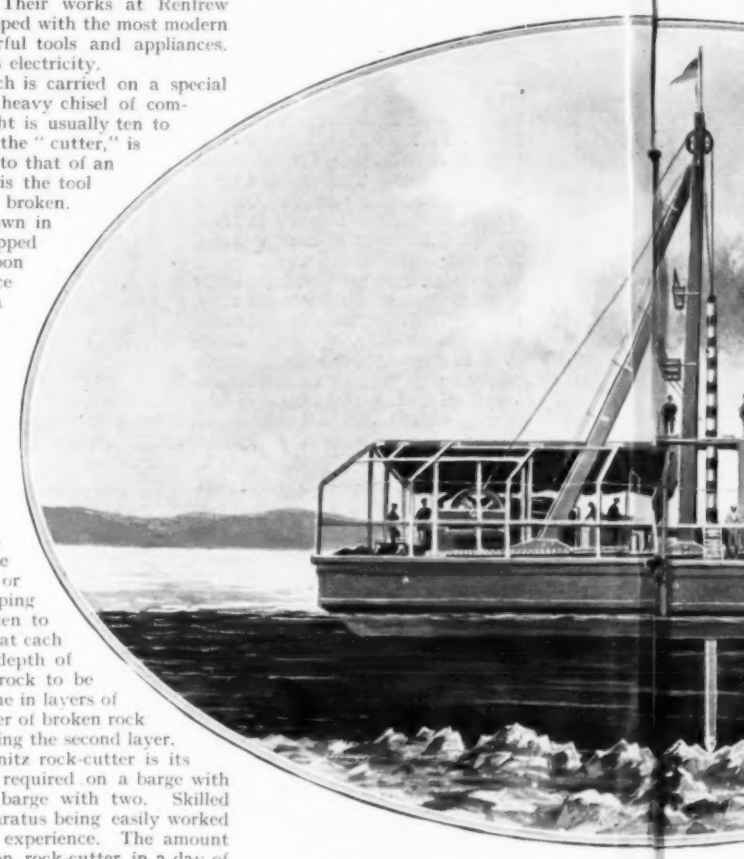
A Lobnitz Rock-Cutter, which is carried on a special barge or pontoon, consists of a heavy chisel of compressed steel, of which the weight is usually ten to fifteen tons. This chisel, called the "cutter," is fitted with a hard point, similar to that of an armour-piercing projectile, and is the tool by means of which the rock is broken. It is suspended vertically, as shown in our central illustration, and is dropped through the bottom of the pontoon on to the rock below (the surface of which is first cleaned) from a height of six to ten feet. By its own weight, the cutter partly pulverises the rock and partly breaks it. The whole force of the impact is concentrated on a very small surface, and this has been found to crush or disintegrate the hardest rock. The cutter delivers blows on the same spot until it has penetrated about three feet into the rock. After the desired penetration at one point is attained, the barge is moved forward three or more feet, and the process of dropping the cutter is repeated. From ten to twenty blows are usually required at each spot to penetrate the rock to a depth of three feet. If the thickness of rock to be broken is greater, it is usually done in layers of three feet at a time, the first layer of broken rock being dredged away before breaking the second layer. One great advantage of the Lobnitz rock-cutter is its simplicity. Only four men are required on a barge with one rock-cutter, and six on a barge with two. Skilled labour is not required, the apparatus being easily worked by an ordinary crew after a little experience. The amount of coal consumed by one ten-ton rock-cutter in a day of ten working hours is one ton.

After the rock is broken by means of the "cutter," the fragments are removed by bucket-ladder dredgers, which Messrs. Lobnitz also build in great variety. By the rock-cutter system the removal of the broken rock is as easy as ordinary hard-dredging, for the "cutter" leaves the débris broken small and on an even surface. Some of the huge buckets used on the largest type of dredger have a capacity of fifty-four cubic feet each. Among the various kinds of dredgers built by the company are bucket dredgers, suction hopper dredgers, some with a special rotary cutter for removing clay; long-shoot dredgers, for conveying the material to a distance; and gold and tin dredgers. The buckets on gold-dredgers are, of course, much smaller than those used for dredging broken rock, as shown in one of our illustrations. One of the most interesting of the new types of dredger is that recently supplied by Messrs. Lobnitz to the Egyptian Government for use on the White Nile, and fitted with a powerful rotary clay-cutter, designed by Mr. A. W. Robinson, of Montreal. The blades of this cutter are made in special form, to cut heavy clay with as little resistance as possible, and



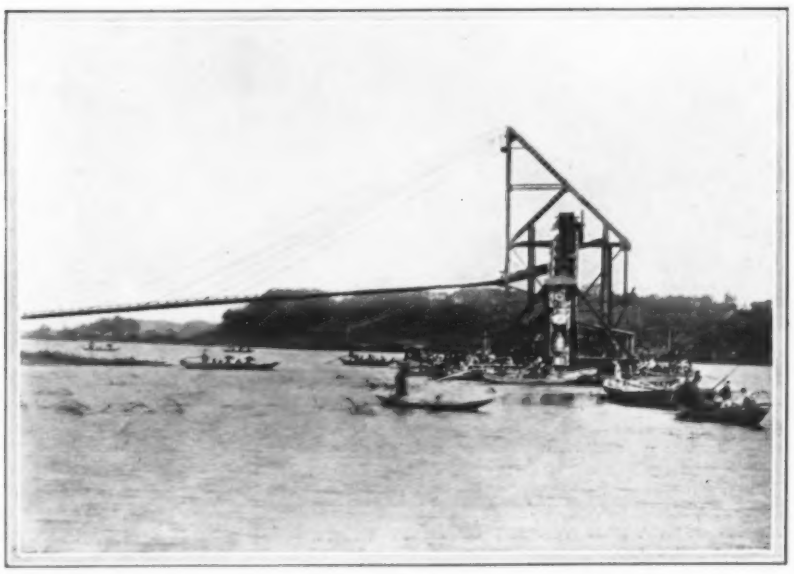
SHOWING THE ROTARY CUTTER: A CLAY-CUTTING HYDRAULIC DREDGER SUPPLIED BY MESSRS. LOBNITZ TO THE EGYPTIAN GOVERNMENT FOR USE ON THE UPPER WHITE NILE.

The rotary cutter is of the Robinson improved type, of cast steel, with renewable cutting edges. This type of cutter apparatus represents the latest development of hydraulic dredging in heavy clay soils. The strength and digging action of the cutter-blades are fully equal to those of the buckets of the ladder type of dredger.

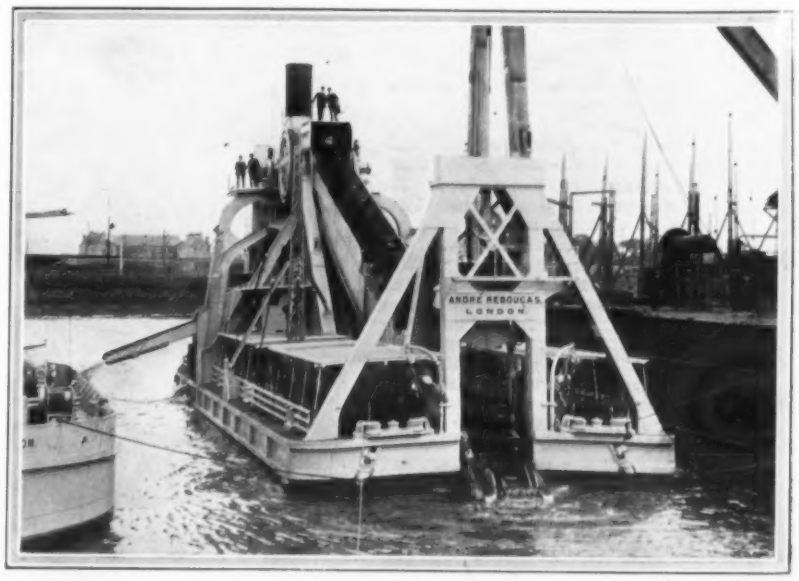


BREAKING ROCKS UNDER WATER WITHOUT THE USE OF EXPLOSIVES: WITH A PATENT LOBNITZ ROCK-CUTTER.

The actual rock-cutter is the heavy vertical steel-pointed chisel which is dropped from a height on the rock and breaks it by the force of its own weight.



BUILT BY MESSRS. LOBNITZ FOR THE TONE RIVER, JAPAN: A LONGSHOOT BUCKET-DREDGER.



BUILT READY FOR TRIALS IN FOUR MONTHS: A NON-PROPELLING BUCKET-DREDGER FOR THE PARA PORT WORKS.

A MARVELLOUS SYSTEM OF ROCK-BREAKING & ROCK-DREDGING.

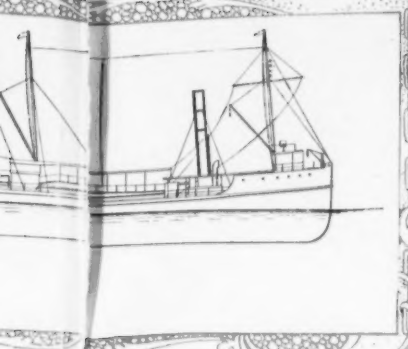
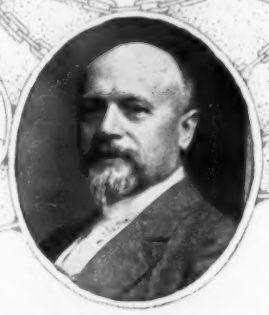


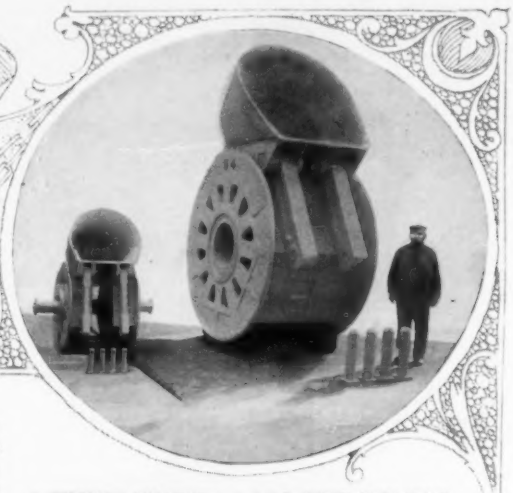
DIAGRAM OF THE DREDGER FOR DREDGING CLAY, ETC.

...charges to its own bopper on either side. It can ...atent Lobnitz pumping apparatus.



THE PRESENT HEAD OF THE FAMOUS FIRM: MR. FRED LOBNITZ.

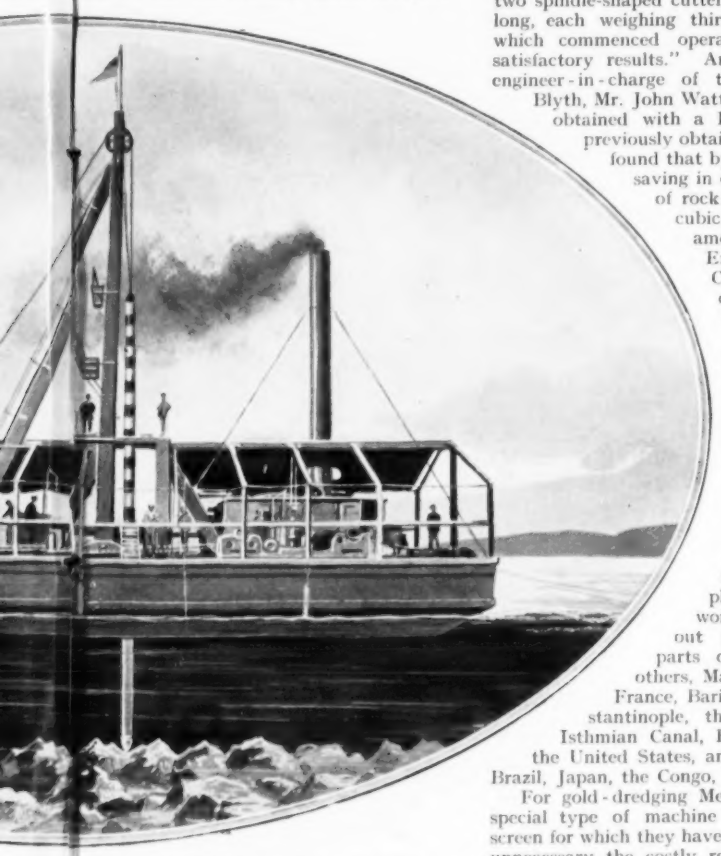
Photograph by Elliott and Fry.



A STRIKING CONTRAST: A FIVE-CUBIC-FEET GOLD-DREDGER BUCKET AND A FIFTY-FOUR CUBIC-FEET HARBOUR-DREDGER BUCKET.

The illustration gives a striking idea of the size of the buckets on the Lobnitz rock-dredgers. An advantage of their rock-cutter system is that it breaks up the rock into pieces of a size easily dredged. For gold-dredging the buckets are much smaller.

...are self-clearing. They are so strong as to withstand the strain of encountering immovable resistances when running at full speed. The machine can, therefore, work in any material that is adapted for hydraulic removal through pipes, just as well as can the ordinary ladder dredgers.



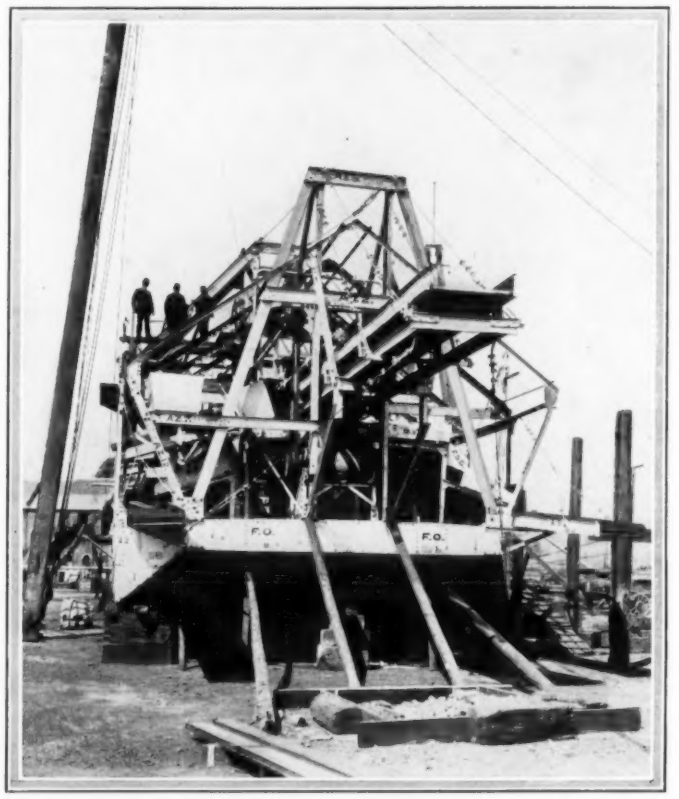
...ITHOUT THE USE OF EXPLOSIVE: A BARGE FITTED ...PATENT LOBNITZ ROCK-CUTTER.

...cal steel-pointed chisel in the centre, which is dropped on ...t by the force of its own weight and fall.

...overn-, and cutter, ...on, of ...er are ...y clay ..., and

Many engineering works of great magnitude have been supplied with rock-breaking and dredging machinery by Messrs. Lobnitz, among the most important being the Suez Canal, the Manchester Ship Canal and the harbour works at Blyth. For the Suez Canal Company they have built more than a hundred vessels, one of which—the largest bucket-dredger afloat—is shown in one of our illustrations. In a paper read before the Institution of Civil Engineers, giving an account of dredging rock in the Canal, the consulting engineer, M. Edouard Quellenec, said, "An apparatus was finally selected, of the type designed by Messrs. Lobnitz and Company, provided with two spindle-shaped cutters of cast steel, 44 feet 7½ inches long, each weighing thirteen tons. . . . This apparatus, which commenced operations in 1902, has given very satisfactory results." Another interesting paper by the engineer-in-charge of the rock-removal operations at Blyth, Mr. John Watt Sandeman, compared the results obtained with a Lobnitz rock-breaker with those previously obtained by drilling and blasting. He found that by the Lobnitz system there was a saving in cost of over 2s. 2d. per cubic yard of rock removed, which on the 500,000 cubic yards under treatment would amount to over £54,000. The Chief Engineer of the Manchester Ship Canal, Mr. W. H. Hunter, in a discussion on Mr. Sandeman's work at Blyth, described the use of Lobnitz rock-cutters on the Canal, where deepening operations involved the cutting, to a depth of two feet for fourteen miles, of Triassic and Permian sandstone of varying hardness, including some very hard siliferous marls. The rate of cost, including breaking, dredging, barging and tipping and towage, had been only a little over 1s. 10½d. per cubic yard. In addition to supplying machinery to these great works, Messrs. Lobnitz have sent out rock-breaking plants to many parts of the world, including, among others, Marseilles, Bayonne, and Brest in France, Bari in Italy, Bilbao in Spain, Constantinople, the Trent Canal in Canada, the Isthmian Canal, Buffalo and the Hudson Canal in the United States, and various places in Argentina, Brazil, Japan, the Congo, and South Africa.

For gold-dredging Messrs. Lobnitz have introduced a special type of machine fitted with a patent propulsion screen for which they have sole rights. This device renders unnecessary the costly revolving screen and elevator of the old type of gold-dredger, treats the gravel more effectively, and discharges it as high as may be desired behind the dredger. Gold-dredgers are erected complete in the works at Renfrew, and run under steam before being taken to pieces for transhipment. With one experienced mechanic they can be easily re-erected abroad. They are built in various sizes. The average size to run night and day with a total crew of six, working in shifts of two at a time, lifts and treats as much gravel each day as a thousand men could do with the hand-rocker and washing arrangement. Besides the large amount of material treated and the economical outlay in doing so, the great advantage of a Lobnitz gold-dredger is that the buckets can be lowered to the necessary depth below the natural water level, and so reach bed rock, often quite unattainable by ordinary hand-washing. It often happens that the richest gold, owing to its weight, is found at the lowest depths. Messrs. Lobnitz make a point of designing every gold-dredger to suit the conditions of the locality. It may be added that they have sent gold-dredgers to many distant countries where the precious metal is found, including South and West Africa, the Straits Settlements, Burma, Siberia, Peru, Bolivia, British and French Guiana, and Tierra del Fuego.



FITTED WITH PATENT PROPULSION SCREEN: A LOBNITZ GOLD-DREDGER ERECTED COMPLETE FOR SHIPMENT IN PIECES TO WEST AFRICA.

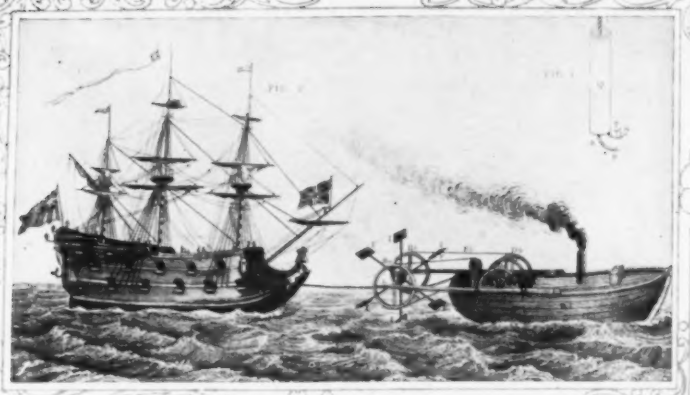
Messrs. Lobnitz have the sole rights for the patent propulsion screen for gold-dredgers. It acts like a riddle in separating the gravel, the fine material being caught on gold-saving tables as usual, while the coarse material is discharged at the end of the propulsion screen. The gravel is accessible and visible while being separated.

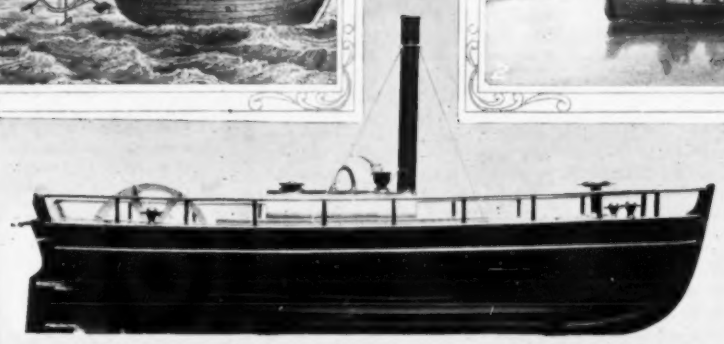
THE LARGEST BUCKET-DREDGER AFLOAT: BUILT BY MESSRS. LOBNITZ FOR THE SUEZ CANAL COMPANY.

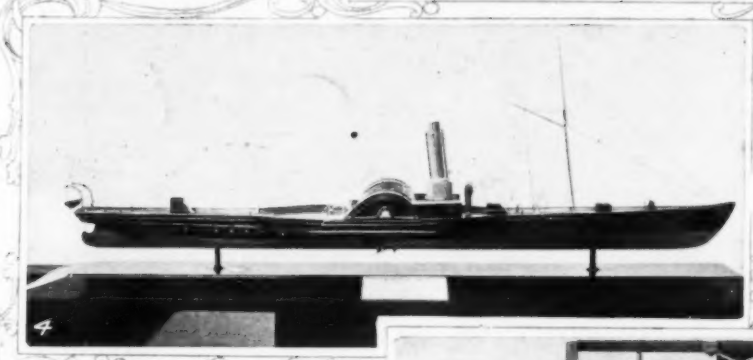
WHERE THE LOBNITZ ROCK-CUTTERS AND DREDGERS ARE BUILT: THE COMPANY'S WORKS AT RENFREW, ON THE CLYDE.

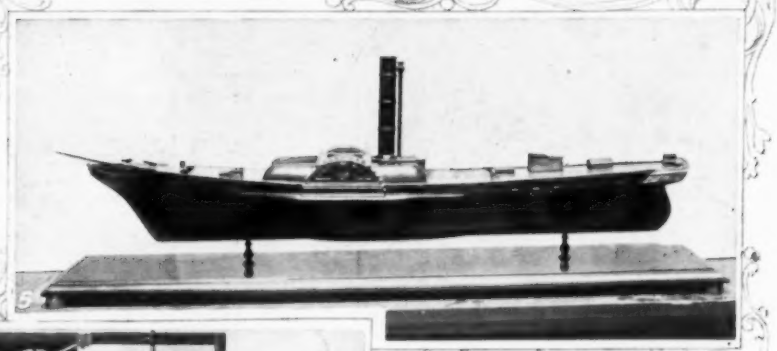
THE STEAM NAVIGATION CENTENARY AT GLASGOW: EARLY VESSELS.

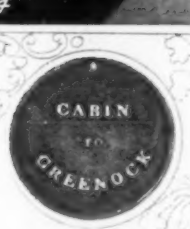
PHOTOGRAPHS SPECIALLY TAKEN FOR "THE ILLUSTRATED LONDON NEWS."

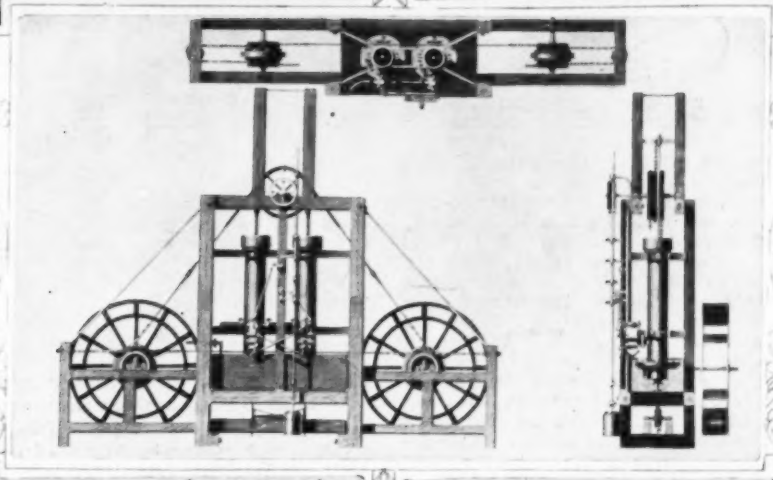


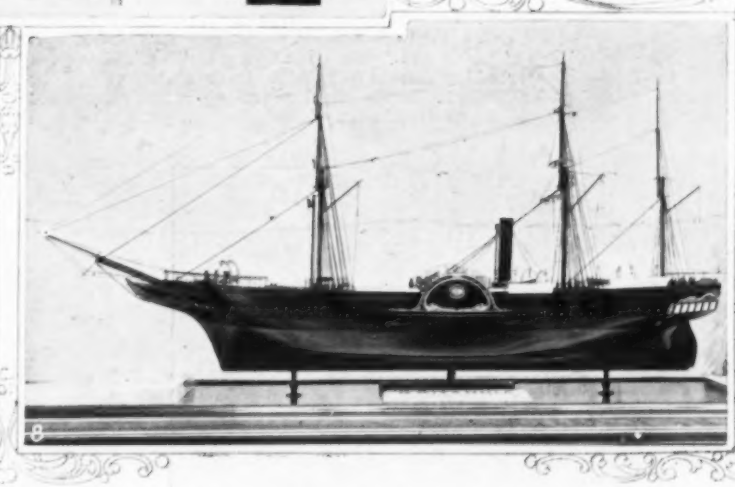












1. PATENTED IN 1736 AS A STEAM-TUG: JONATHAN HULLS' STERN-WHEEL STEAMER.
2. UNDER STEAM ON DALSWINTON LOCH IN 1788: PATRICK MILLER'S BOAT.
3. BUILT BY ALEXANDER HART IN 1801, AND ENGINED BY WILLIAM SYMINGTON: THE STERN-WHEEL STEAMER "CHARLOTTE DUNDAS"—A MODEL.
4. THE FIRST STEAMER BUILT OF STEEL: THE PADDLE-STEAMER "WINDSOR CASTLE," CONSTRUCTED IN 1859—A HALF-MODEL.
5. BUILT IN 1830: THE PADDLE-STEAM-YACHT "MENAI"—A MODEL.
6. WILLIAM SYMINGTON'S MARINE STEAM-ENGINE, MADE IN 1788: DETAILS.
7. THE FIRST BRITISH VESSEL TO CROSS THE ATLANTIC CONTINUOUSLY UNDER STEAM: THE PADDLE-STEAMER "SIRIUS" (BUILT IN 1837).
8. THE FIRST CUNARD LINER (BUILT IN 1837): A MODEL OF THE PADDLE-STEAMER "BRITANNIA" (1154 TONS), WHOSE MAIDEN VOYAGE, TO BOSTON, WAS MADE IN 1840.

We illustrate above a number of the exhibits in the British Steam Navigation Centenary Exhibition in the Kelvingrove Museum, Glasgow. In the border are (at the top) the two sides of a lead return ticket for the Helensburgh and Gareloch steamers; (below on the left) the two sides of a brass token, "Cabin to Greenock"; and (below on the right) the two sides of the silver medal "presented to John Wood by the Royal Society in Edinburgh," in 1844, for his invention of a self-registering tide-gauge. With regard to other illustrations we may give the following notes: Hulls is said to have tried his scheme experimentally on the Avon in 1737, but abandoned it later. The "Charlotte Dundas" was 56 ft. long and was tried on the Forth and Clyde Canal, when it towed two vessels of seventy tons burden to Port Dundas at a speed of over three miles an hour against a head wind. The experiment was given up from fear of injury to the canal banks. The "Windsor Castle" plied between Glasgow and Rothesay, and was 190 ft. long by 20 ft. beam, and had a depth of 7 ft. 6 in. The "Menai" had engines of a nominal 110 horse-power and a tonnage of 230. Symington's engine was an atmospheric engine with separate condenser, and so was covered by Watt's patent; possibly this is why it was so soon abandoned. The "Sirius" (703 tons) crossed the Atlantic in April 1838. The passage from Queenstown to Sandy Hook took eighteen days.